THE

QUEENSLAND AGRICULTURAL JOURNAL,

ISSUED BY DIRECTION OF

THE HON. THE SECRETARY FOR AGRICULTURE.

EDITED BY A. J. BOYD F.R.G.S.Q.

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VOLUME XV.

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1921.

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QUEENSLAND AGRICULTURAL JOURNAL

Vol. XV. JANUARY, 1921. Part 1.

Greetings for 1921.

Agriculture.

HARVESTING WHEAT, NEAR ALLORA, 1920.

The wheat harvest of 1920 promises to be a record for Queensalnd, and the subject of the illustration has been a familiar sight throughout the wheat belt during the past two months.

The machine (the Reaper-Thresher or Header here shown) is quickly taking the place of the Harvester and Stripper; its chief advantages being in its ability to get over more country and pick up lodged and tangled crops. The area photographed is one of the many that are returning heavy yields of wheat and barley, and is situated about 1½ mile from Allora, on the Hendon side. The noted Goomburra Valley lies to the right of picture.

The varieties in this vicinity:—Amby, Florence, Piastre, Coronation, Rudd's Early, Bunge, and Gluyas are representative of the bulk crops throughout, and their respective yields are within reach of 30 bushels per acre.

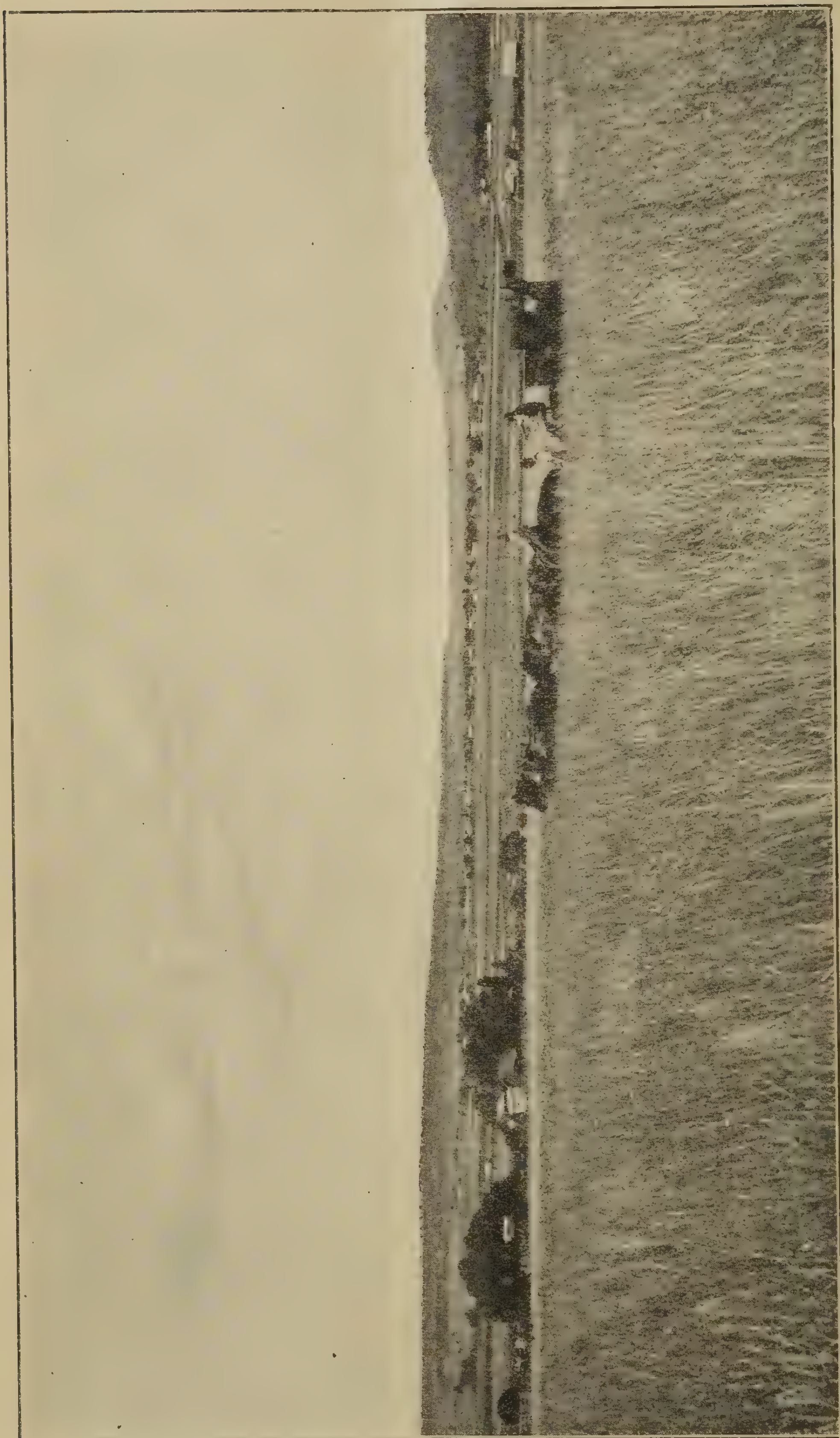

PLATE 1.—HARVESTING WHEAT NEAR ALLORA, 1920.

SMALL HOLDINGS AND MIXED FARMING.

We doubt if the opinion of a writer on this subject in "The Farm," a very excellent journal devoted to the farming and grazing industries in South Australia, will be accepted as gospel by the proprietors of agricultural homestead selections in any part of Queensland, with the exception of some of them who pin their faith on a sugar-cane crop. He states that—"Now that mixed farming has become the order of the day, and is being constantly drilled into the man on the land as the only hope of success, he is quite prepared to be called a "crank," or behind the times, when he calls into question the wisdom of mixed farming as applied more especially to small holdings. Many years, both of personal experience and wide observation, had forced him to the conclusion that in very many cases, mixed farming is simply a delusion." He quotes Mr. Carnegie, of library fame, who said, when asked what was the chief thing which leads to success: "Put all your eggs into one basket, and watch the basket." "This statement," he says, "puts his theory into a nutshell exactly."

"Now," he writes, "take the case of a man who has, say, up to 40 acres, a large portion of it being hilly country, and practically useless except for a little grazing. He is keeping two or three pigs, a couple of cows and horses, is growing fruit and vegetables, potatoes, strawberries, &c., and about one-half of his time is occupied in taking his stuff to the market; the other half is put in at really hard work in the garden, and it will be generally agreed that market gardening is about the limit as regards hard toil and long hours. His total average income only provides a bare living. Why? Because of the simple fact that he has more to attend to than he can possibly manage. Some work is always in arrears. He is working on vegetables when the pruning should be done; he is hoeing potatoes while the hoeing of strawberries is neglected; he is digging potatoes when the spray pump should be going; and while he is away at the market the whole machinery is stopped, and so it goes on throughout the year.

"Now, my contention is, that instead of having all these irons in the fire, were he to specialise and concentrate on one thing, it would not only considerably lessen his labour and worry, but would return a far larger income. For instance, he has been growing half an acre of potatoes. Four acres would return more than his present income with half the labour. He has kept two cows. A dozen would provide a fine income, and he could grow all their feed. I give these two items merely as an example, but the same good results would follow were he to specialise in any one of the many departments which at present are a source of worry and hard work, and which, all combined, fail to provide him with either leisure or a fair income.

"I would like the occupiers of small holdings to seriously think the matter out, and I feel confident that they would bless the day when they resolved to specialise."

To every question there are usually two sides, and there are certainly two sides to this dictum. Suppose that a farmer plants 4 acres of potatoes on his 40-acre selection, and no other crop. At the proper time they are hilled up. How is the grower going to fill in his time until his potatoes are ready to be dug? Or what source of income has he, when the potato crop has been ruined by blight or frost or market falls? There are many crops which do not demand any special attention after planting or sowing. Such are lucerne, sweet potatoes, sorghums, oats, maize, arrowroot, sugar-cane, cotton, cereals, and many market-garden crops, which make no great demand upon the farmer's labour. So with various fruits; the fruitgrower does not spend all his time in pruning and spraying his trees, and as for market gardening being "the limit as regards hard toil and long hours," we never found this to be the case when on our farm, even before the scrub land had been stumped. All our work on the crops was done with the hoe. The various crops were kept clean and were harvested in their proper season, and there was plenty of time to attend to the wants of a few pigs and fowls. It not unfrequently happens that unseasonable frosts destroy the young maize, that potatoes have succumbed to disease, that cereal crops are destroyed by rust, smut, heavy rains, caterpillars, &c., &c. In such cases, whence is the one-crop farmer to obtain the means of carrying on? His only hope of making both ends meet will have vanished with his loss. If he possess a few cows, pigs, and fowls he may make something out of them by buying food for them, but in drought time the cost of fodder would probably be prohibitive. The one-farm-one-crop theory will be found in practice to be unworkable and unprofitable. Mixed farming will pull the farmer through a bad season. Specialising is doubtless profitable in trade, in stockbreeding, in a manufacturing business, and in certain arts and sciences and inventions, but we would not apply it to farm crops.

ROMA STATE FARM.

WINTER CEREAL EXPERIMENTS, 1920.

METEOROLOGY.

In January and during the first week in February good rains were experienced. This brought about a growth of weeds which it was impossible to adequately deal

with; at the same time hot drying winds were a prominent feature in the meteorological conditions, consequently the benefits derived by the soil with relation to its moisture content was not nearly as great as might be expected. The balance of February was dry, likewise the months of March and April, precipitation being low, and hot, drying winds prevalent. These conditions undoubtedly curtailed very considerably the total area sown with wheat in the district, and at the same time resulted in a decrease in the May sowings, with a corresponding increase in the later ones. In May, 95 points of rain fell, but owing to the manner in which it fell, the very dry condition of the surface soil, and the absence of available moisture in the subsoil, it was of very little value, even on the light soils, whilst on the heavier soils it was injurious rather than beneficial, causing as it did the grain to start into growth, and die through lack of moisture to carry it on. It was not until the second week in June that rain to do any good was experienced; 263 points were then recorded. This, followed as it was by congenial conditions, wrought a great change in the immediate prospects of the winter cereal crop. July was mild and wet, resulting in exceptional growth being made, with a correspondingly heavy drain on the moisture reserves, which throughout the whole period were low. August came in like spring, and active growths were maintained for a period, but as the first three weeks were dry the available moisture was utilised, and by the middle of the month the crops began to suffer. About this time the atmospheric conditions became more humid, and rust, which had been present more or less throughout the plots, began to spread rapidly. Fortunately, towards the end of the month a cold snap was experienced, the thermometer on one occasion registering 31 degrees Fahrenheit in the screen. This retarded for a period the progress of the fungus. The frosts occasioned very little damage on the farm; but one or two growers had fields of early crops practically destroyed. The first two weeks in September were just ideal for the propagation of rust; in consequence, some of the more susceptible kinds of wheat became heavily infested, the red colouring due to its presence being noticeable at a great distance. In the latter part of the month a cool, dry change set in. A little damage was occasioned by the frost, but it was the salvation of the late wheat so far as rust was concerned. This dry spell extended into October and ultimately caused the mid-season sown crops, and those others which were rank, to ripen off prematurely. On the 13th rain commenced to fall, and of the twelve following days eight were wet. This caused a good deal of weathering in the early grain, but it was of very little benefit to the mid-season wheats, while improving the yield from the late sown areas considerably.

Harvesting operations, which commenced on the 12th October and finished in the latter part of November, were considerably hampered by damp weather, rain being recorded twenty times during that period, though on some occasions the falls were insufficient for record purposes. The atmosphere was so laden with moisture as to render garnering operations impossible.

The following is a tabulated list of the rainfall:—

Month.	Wet Days.	Highest Fall. Points.	Total. Points.
December	3	64	129
January	8	93	268
February	4	135	330
March	3	25	59
April	10	22	56
May	10	33	95
June	12	165	319
July	8	100	303
August	10	145	82
September	6	54	175
October	9	135	304
November	11	29	76
	94		2,196

MANURIAL EXPERIMENTS.

Area of blocks—¼-acre each.

Preparation of seed-bed necessitated one ploughing, one cultivation, and one harrowing.

Sown on 10th May; bulk of seed germinated on 20th May.

Crop harrowed on 24th June.

Few ears peeping on 20th August; bulk of crop out in head on 26th August.

Ripe, third week in October.

Harvested on 29th October.

Variety—Bunge No. 1.

Seed treated with copper carbonate to prevent smut (bunt).

No.	Manure.	Cost.	Yield per Acre.	Remarks.
		£ s. d.	Bushels.	
1	Shirley's Super (½-cwt. to acre)	0 5 0	24	Crop fairly tall, thin, not very flaggy, slightly rusty; fairly even in height; germination even; stood up well; grain weathered.
2	Shirley's Super (1 cwt. to acre)	0 10 0	23·8	As in the last block, the soil is a sandy loam. Crop was fairly tall, thin, not very flaggy; slightly rusty. Germination even; stood up well; crop slightly uneven. Grain weathered.
3	Shirley's Super (1 cwt. to acre). Top dressing not applied	0 10 0	26·8	Same remarks as applied to Nos. 1 and 2.
4	Unmanured (Control)	..	25·2	Crop uneven; not as tall as the manured block; thin; little flag; rust. Germination even; very little of this crop lodged; grain weathered.
5	Superphosphate (1 cwt. per acre)	0 9 6	28·9	Soil more loamy; germination uneven; crop uneven in height, flaggy in places, and rusty; stooled well; grain weathered.
6	Thomas's Phosphate (unprocurable)	..	28	Manured with superphosphate and seed drilled in at the rate of 1 bushel to the acre instead of ½-bushel. Crop thick; flaggy in places; straw finer than in other plots. Germination uneven; crop rusty. Grain weathered and pinched.
7	Stable manure Last application 1916 ½-cwt. Superphosphate	2 5 9 / 0 5 0	28	Crop very uneven; very flaggy; most affected by dry conditions; weathered badly; white tipped; rusty; germination fairly even; crop rusted. Grain pinched and weathered. Crop stooled very well, but was weedy. At one stage of its growth it was easily the best block in the section to look at and, if cut at the stage when most suitable for hay, would have been capable of producing the heaviest return (hay).
8	Superphosphate (½-cwt.). Top dressing not applied	0 4 9	31·3	Soil uneven; germination and height of crop uneven. Stooled well for the most part, flaggy, tall, rusty. Grain fairly even; weathered.

No.	Manure.	Cost.	Yield per Acre.	Remarks.
9	Sulphate of Potash (½-cwt.) Nitrate of Soda (½-cwt.) Superphosphate (½-cwt.)	0 8 0 0 6 9 0 4 9	29·3	Soil uneven, major portion a clayey loam, ranging from sandy loam to stiff clay. Germination and growth very uneven; stooled well; flaggy; rusty; fairly tall crop; portion lodged.
10	Dried Blood (½-cwt.) Sulphate of Potash (½-cwt.) Super (1 cwt.)	0 4 6 0 8 0 0 9 6	26·3	Soil uneven, similar to that of Block 9. Remarks applied to the latter also apply to this block, the only difference being that a slightly larger percentage of the crop had lodged.
11	Control (unmanured)	..	23·1	This block contains the largest area of unkind soil, consequently the crop was more uneven than any of the other crops. Badly rusted in places.
12	Dried Blood (½-cwt.) Sulphate of Potash (½-cwt.) Thomas's Phosphate (1 cwt.)	0 4 6 0 8 0 0 5 6	30·2	Owing to the fact that it was impossible to obtain Basic slag, "super" was substituted, consequently Plots 10 and 12 have the same application of manure. The soil on the whole is better than in Blocks Nos. 10 and 11. Crop uneven, tall in places, lodged where soil was rich; stooled well; flaggy in places; rusty; grain weathered; germination uneven.
13	Dried Blood (½-cwt.) Sulphate of Potash (½-cwt.) Superphosphate (1 cwt.) Top dressing not applied.	0 4 6 0 8 0 0 9 6	24·8	Owing to the top dressing not being applied this experiment is practically the same as Blocks 10 and 12. The difference in yield must be due to the difference in the soil, though it appears to be practically the same over both. Other remarks as applied to No. 12.

Pre-war prices have been quoted for Nitrate of Soda, Sulphate of Potash and Basic Slag.

From the results obtained this year it would be utterly impossible to gain any idea as to the value or otherwise of applying manures in connection with wheat culture, but a perusal of the following table, covering a period of nine years, shows that an increase in yield of 2·4 bushels per acre can be secured by applying 1 cwt. of Superphosphate per acre.

Block.	1910.	1911.	1912.	1913.	1914.	1916.	1918.	1919.	1920.	Block Total.	Average, 9 years.
1	17·2	26·8	20·6	25·6	20·5	29·5	17·2	5	24	186·4	20·7 +
2	18·8	28·6	22·6	26·9	23·5	29·2	19·1	7	23·8	199·5	22·1 +
3	20·2	28·3	23·6	27·6	24·2	29·8	21·4	7·3	26·8	209·2	23·2 +
4 Control	17·6	20·4	18·4	21·4	21·6	30·1	17·6	5·8	25·2	178·1	19·8 —
5	21·3	26·1	20·6	24·1	22·4	31·2	18·5	6·9	28·9	200	22·2
6	17·0	21·2	20·2	23·2	22·6	30·4	18·7	7·3	28·0	188·6	20·9 +
7	17·7	22·1	24·8	21·2	26·6	24·9	22·1	5·0	28·0	192·4	21·4 —
8	18·8	21·2	19·3	22·0	24·1	28·4	18·3	5·5	31·3	188·9	20·9 +
9	19·3	17·3	15·7	18·2	24·4	29·5	14·1	5·7	29·3	173·5	19·2 +
10	19·3	20·3	19·8	21·6	25·6	30·6	15·2	5·6	26·3	184·3	20·4 +
11 Control	18·2	19·0	17·6	22·0	22·6	28·9	14·1	5·8	23·1	171·3	19·0 +
12	18·5	25·3	19·1	23·6	26·2	29·8	16·4	5·6	30·2	194·7	21·6
13	19·9	24·8	17·3	23·6	27·1	30·6	12·9	5·0	24·8	186·0	20·6 +
Annual Total	243·8	301·4	259·6	301·0	311·4	382·9	225·6	77·5	349·7	2,452·9	272·0
Yearly Average	18·75	23·17	19·96	23·15	23·95	29·45	17·35	5·96	26·9	188·6	20·9 Average

In 1915 it was impossible to prepare the seed bed, the rainfall for the first four months was only 110 points.

In 1917 seeding rains were delayed until the end of August. During April, May, June, and July only 84 points of rain fell.

In 1919 the rainfall during June, July, August, September, and October was 102 points.

SNOW IN ARGENTINA.

While Argentina has a large capacity for canesugar production, we now learn that they sometimes have severe snow falls and frosts. The illustration is a view of the cane field at the Tucuman experiment station where Dr. Cross, formerly of Louisiana, is now a director, and while Dr. Cross has had experiences of cold weather in Louisiana, we doubt of his ever having seen the cane field so covered with snow on the leaves of the cane as is shown in the illustration. We are indebted to Mr. George S. Brady, of the American Trade Commissioner, in the absence of the commercial attache, for the illustration and data.

It is said that for the first time in the history of Argentina snow fell in the northern provinces on 12th July, and completely killed the cane crop. It is estimated that fully one-third of the production of sugar will be lost. Some of the Argentina sugar men are of the opinion that grinding cannot continue through 15th September as estimated, and, as a consequence a considerably larger amount will be lost. Argentina lies about 26 degrees south of the equator, just outside the southern tropic, while the sugar districts of Louisiana lie about 25 to 30 degrees north of the equator. There is considerable similarity in the relative position of that section of Argentina and the sugar section of Louisiana. The month of July in Argentina, so far as the

PLATE 2.—SNOW IN ARGENTINA.

cane crop is concerned, would compare with the months of January in Louisiana, and long experience has taught us here to avoid any sugar cane grinding in January if practicable. Sometimes with large crops and bad weather our sugar grinding seasons have been extended into February, or even 1st March, but such seasons are generally disastrous. In Louisiana November and December are the months for harvesting sugar-cane crops, and great efforts are made to finish before the Christmas holidays. Tucuman, unless its temperature has changed by the topographical situation in some way, should be somewhat somewhat similar to the average Louisiana sugar season temperature. Here, where larger crops are made, it is quite common to prepare for the cold weather by cutting down large quantities of the cane and throwing them into what we call windrows, leaving the cane throughly well covered with their own leaves in such a way that freezing weather would not affect them. Our correspondent says that in Tucuman the canes were killed presumably by the freeze with the snowfall of which we give the illustration. There was a freeze in Louisiana in 1856 that seemed to have been as disastrous here as the recent freeze was in Argentina. We are lead to believe that our plan of windrowing in Louisiana would be quite a protection to sugar planters in Argentina whenever their cane harvests are delayed until July, which in their country south of the equator is the equivalent of our January, north of the equator.—''Louisiana Planter.''

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1920.

There was a drop in the output for the month of November. Hot weather of a trying nature, accompanied by storms, caused the majority of the birds to slow down. Broodiness has been very tiresome, not only in the heavy section, but in the light section also, and in a number of cases two birds from a pen were removed to the broody coops. More Leghorns have been broody during this than in the three preceding tests. L. G. Innes and N. A. Singer's pens of White Leghorns each laid 159 eggs for the month, and in the heavy section R. Burns's pen of Black Orpingtons put up the highest total of 146. The following are the best sequences now in progress, or finished up during the month of November:—

A. Shanks's "B" bird, an unfinished sequence of 89 eggs; R. Burns's "C" bird, an unfinished sequence of 36 eggs; L. G. Innes's "D" bird, an unfinished sequence of 56 eggs; N. A. Singer's "D" bird, an unfinished sequence of 48 eggs; D. Fulton's "F" bird, finished a sequence of 34 eggs on the 26th; Dr. Jennings's "B" bird, finished a sequence of 43 eggs on the 18th; N. A. Singer's "E" bird, finished a sequence of 47 eggs on the 6th; Haden Poultry Farm's "A" bird, finished a sequence of 43 eggs on the 22nd; E. F. Dennis's "E" bird, finished a sequence of 76 eggs on the 12th.

There was one death during the month, A. Shanks losing his "C" hen on the 21st, through ovarian complications. The following are the individual records, with the classification of the various pens:—

Competitors.	Class.	Breed.	Oct.	Total.
		LIGHT BREEDS.		
*G. Trapp	I.	White Leghorns ...	137	1,046
*Haden Poultry Farm	I.	Do.	140	1,044
*O. W. J. Whitman	II.	Do.	136	1,035
*J. M. Manson	I.	Do.	144	1,010
Geo. Lawson	I.	Do.	136	1,001
*J. D. Newton	II.	Do.	139	1,000
*J. J. Davies	I.	Do.	137	998
*Quinn's Post Poultry Farm ...	II.	Do.	135	991
*W. Becker	I.	Do.	141	974
*N. A. Singer	I.	Do.	159	974
*Dr. E. C. Jennings	I.	Do.	139	971
*L. G. Innes	II.	Do.	159	962
Mrs. R. Hodge	I.	Do.	146	940
*W. and G. W. Hindes	I.	Do.	120	939
*J. H. Jones	I.	Do.	126	935
*G. Williams	I.	Do.	132	935
*E. A. Smith	I.	Do.	137	935
*H. Fraser	I.	Do.	130	933
*T. Fanning	I.	Do.	129	923
*S. McPherson	II.	Do.	97	920
*Mrs. L. Anderson	I.	Do.	132	910
B. Chester	I.	Do.	137	900

EGG-LAYING COMPETITION—*continued.*

Competitors.	Class.	Breed.	Oct.	Total.
LIGHT BREEDS—*continued.*				
S. L. Grenier	I.	White Leghorns ...	123	892
*Mrs. L. Henderson	I.	Do.	135	880
*Thos. Taylor	II.	Do.	140	878
*Range Poultry Farm	II.	Do.	123	877
*S. W. Rooney	II.	Do.	122	877
Thos. Eyre	I.	Do.	110	876
Avondale Poultry Farm	III.	Do.	109	828
B. Chester	I.	Do.	108	823
W. Morrissey	I.	Do.	92	819
H. P. Clarke	I.	Do.	109	805
R. C. J. Turner	II.	Do.	121	803
C. Langbecker	IV.	Do.	103	776
S. Chapman	I.	Do.	131	769
C. H. Towers	I.	Do.	109	765
C. M. Pickering	III.	Do.	100	760
W. D. Evans	II.	Do.	125	745
H. A. Mason	III.	Do.	125	745
A. J. Andersson	III.	Do.	83	736
C. A. Goos	II.	Do.	122	700
Miss E. M. Ellis, not judged ...	...	Do.	Withdrawn	583
HEAVY BREEDS.				
*E. F. Dennis	II.	Black Orpingtons ...	126	1,028
*R. Burns	II.	Do.	146	1,025
*R. Holmes	I.	Do.	113	1,022
*A. Shanks	I.	Do.	139	1,016
*D. Fulton	I.	Do.	102	980
*E. Morris	II.	Do.	128	969
*A. Gaydon	II.	Do.	127	969
*W. Smith	I.	Do.	123	932
H. M. Chaille	I.	Do.	82	922
*A. E. Walters	II.	Do.	106	914
*E. Oakes	I.	Do.	134	893
*J. A. Cornwell	I.	Do.	130	889
J. E. Smith	I.	Do.	107	874
*T. Hindley	IV.	Do.	119	873
*R. B. Sparrow	III.	Do.	114	850
Mrs. G. H. Kettle	I.	Do.	119	842
Parisian Poultry Farm	I.	Do.	109	839
R. C. Cole	II.	Do.	116	822
G. Muir	II.	Do.	87	820
*J. E. Ferguson	I.	Chinese Langshans ...	91	772
*E. Stephenson	II.	Black Orpingtons ...	110	770
*Nobby Poultry Farm	I.	Do.	99	766
G. Flugge	IV.	Do.	109	652
Total	...	...	7,814	57,652

* Indicates that the en is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	186	171	182	170	179	158	1,046
Haden Poultry Farm	197	148	193	181	160	165	1,044
O. W. J. Whitman	162	162	189	171	164	187	1,035
J. M. Manson	165	174	183	167	155	166	1,010
J. Newton	193	158	171	119	176	183	1,000
J. J. Davies	175	167	166	174	166	150	998
Quinn's Post Poultry Farm	184	172	173	162	144	156	991
W. Becker	170	166	178	161	139	160	974
N. A. Singer	165	148	169	186	160	146	974
Dr. Jennings	148	184	149	149	156	185	971
L. G. Innes	111	154	181	172	188	156	962
W. and G. W. Hindes	161	158	135	166	150	169	939
J. H. Jones	155	154	160	168	166	132	935
G. Williams	151	157	160	153	179	135	935
E. A. Smith	155	139	172	152	156	161	935
H. Fraser	135	154	169	165	162	148	933
T. Fanning	64	170	162	173	179	175	923
S. McPherson	176	175	91	137	186	155	920
Mrs L. Anderson	178	165	165	142	130	130	910
B. Chester	152	128	157	159	155	149	900
Mrs. Henderson	132	143	155	143	164	143	880
Thos. Taylor	171	156	117	158	137	139	878
Range Poultry Farm	107	155	155	172	139	149	877
S. W. Rooney	123	124	171	137	154	168	877
HEAVY BREEDS.							
E. F. Dennis	182	155	167	180	164	180	1,028
R. Burns	169	153	197	154	185	167	1,025
R. Holmes	161	178	167	169	176	171	1,022
A. Shanks	150	175	153	192	140	206	1,016
D. Fulton	167	181	155	168	92	217	980
E. Morris	169	164	170	134	163	169	969
A. Gaydon	163	199	160	139	126	182	969
W. Smith	110	189	170	171	148	144	932
A. E. Walters	140	153	141	174	130	176	914
E. Oakes	134	179	157	82	174	167	893
J. Cornwell	148	179	154	106	135	167	889
T. Hindley	155	176	142	169	103	128	873
R. B. Sparrow	157	92	162	141	134	164	850
J. E. Ferguson	91	137	98	127	178	141	772
E. Stephenson	168	119	132	139	111	101	770
Nobby Poultry Farm	153	195	83	199	116	20	766

CUTHBERT POTTS,
Principal.

NOTES ON "TRUENESS TO TYPE."

Light Breeds.

Name.	Class.	Comments.
Mrs. Anderson	1	Good size; inclined to upright comb.
H. Fraser	1	Solid uniform pen; splendid doers.
B. Chester	1	Uniform; ideal headpieces; C and D a trifle narrow across shoulders.
Quinn's Post Poultry Farm	2	E and F high tail carriage; great stamina; reachy carriage.
T. Fanning	1	A pleasing pen; nice full bone.
E. A. Smith	1	Another pleasing pen; E and F our choice.
Thos. Taylor	2	Diminutive combs; too upright in carriage.
Range Poultry Farm	2	Tail carriage variable; good bodies.
S. W. Rooney	2	Lack uniformity; A our preference.

Name.	Class.	Comments.
O. W. J. Whitman	2	Hard good doers; headpieces away from a Leghorn; reachy carriage.
S. McPherson	2	Very uniform in type; B side spikes.
J. H. Jones	1	A good pen throughout.
G. Trapp	1	Very even; beautiful head points; great doers.
L. G. Innes	2	Could do with more substance; outline good.
W. Becker	1	Uniform; great doers.
Geo. Williams	1	A very pleasing pen; tight in feather.
J. J. Davies	1	Good all round pen; excellent headpieces.
Dr. Jennings	1	As near our ideal as any in the test.
N. A. Singer	1	Uniform in outline; great workers; A and F our choice, if any.
Haden Poultry Farm	1	Good in stamina which carries the pen through; combs inclined to be too upright.
J. W. Newton	2	Side spikes in evidence; good constitutions.
W. and G. W. Hindes	1	A fine pen throughout; every bit Leghorn.
J. M. Manson	1	A trifle small; E ideal.
Mrs. Henderson	1	Very uniform; F rather high in tail.
S. Chapman	1	Good headpieces; a satisfactory pen.
E. Chester	1	Very uniform; ideal heads.
Avondale Poultry Farm	3	Too small.
C. Goos	2	Good outline and Leghorn characteristics, but not the best of doers.
R. Turner	2	Lack uniformity.
G. Lawson	1	Even; hard; good doers.
W. D. Evans	2	Very uniform; splendid outline; poor feeders.
Thos. Eyre	1	Very even; a good hard pen.
C. Langbecker	4	Lack uniformity; inferior headpieces.
H. Mason	3	On small side; not the best of doers.
C. Pickering	3	Too fine; lack substance; diminutive heads.
C. H. Towers	1	Uniform; good doers.
S. L. Grenier	1	Not the largest, but hard; good doers.
W. Morrissey	1	Uniform; good in head points.
A. J. Anderssen	3	Size and type variable.
H. P. Clarke	1	Good long backs; possess size.
Mrs. R. Hodge	1	The largest in the test; grand outlines; beautiful headpieces; one inclined to too high tail carriage.

Heavy Breeds.

T. Hindley	4	Type variable; C and D white lobes.
J. Cornwell	1	One of the best utility Orpington pens in test; lovely heads.
E. Morris	2	Type variable.
E. A. Walters	2	One of the largest pens in test; inclined to leg and tail; grand eyes.
R. B. Sparrow	3	Full of variations.
Nobby Poultry Farm	1	Uniform; could do with a little less tail.
A. Shanks	1	A very pleasing pen; D our choice, if any.
R. Burns	2	Type variable; we prefer A.
E. Oakes	1	Good, strong, uniform pen; a little too much tail; beautiful heads.
W. Smith	1	Uniform, solid pen; E pale in eye colour.
E. Stephenson	2	Variable type; too long in back and tail.
E. F. Dennis	2	E small; otherwise good pen.
J. E. Ferguson	1	Uniform; free from the defects seen in previously competing Langshans.
R. Holmes	1	Uniform; good heads.
D. Fulton	1	Uniform pen; we like C very much.
J. Gaydon	2	Inclined to too much tail.
Parisian Poultry Farm	1	Big, solid hens; great eyes.
Mrs. G. H. Kettle	1	Very uniform; neat headpieces.
H. Chaillie	1	Just managed this class; would like to see a little more substance.
G. Flugge	3	Too taily.
G. Muir	2	Side spikes in evidence; inclined to too high tail carriage.
J. E. Smith	1	Very even pen; lower to ground than the majority.
D. Cole	2	Variable type; good doers.

DOES POULTRY KEEPING PAY?

By R. T. G. CAREY (Muscovy Breeder), Beerwah, Queensland.

"Sow in waste and you will reap in want," is a maxim the truth of which the poultry industry is already beginning to realise and will realise much more fully, I am afraid, ere long. It is the true adage, if economy is not fully exercised, seeing that some middlemen are not contented with reasonable profits. In November nearly all the market agents notified their higher charges upon the sale of our product, as well as increased charges for commissioned work they do for the farmer, with the result that the greatest distress is being experienced in the poultry world. Large breeders, with a record of over half a century's successful trading behind them, have culled their stocks to the verge of non-existence; consequently, the outlook for the future is gloomy since supplies of birds to replenish the outlying districts are so scarce that those breeders are at their wit's end to promptly meet demands. It is no wonder that buyers of young stock, be it baby chicks or day-old ducklings, are unable to have their orders filled on dates specified, but are told they have to wait for a month or a little longer, because the rush was so great, or the stock was not on hand. I here show some figures from a prominent plant, its cost of maintenance, the receipts, &c., to and from all sources, as follows:—

Expenditure.	£	*s.*	*d.*
Postage stamps	2	16	9
Freight	4	2	9
Feed bill	54	19	8
Advertisement	25	10	0
Printing catalogue	8	8	0
Total expense	95	17	2
Income.			
Books sale	5	7	6
Eggs sale	33	10	3
Duck sale	25	11	0
Duckling sale	52	12	0
Fowl sale	12	11	9
Chick sale	15	15	0
Sundries	6	4	3
	£151	11	9
Value of stock on hand	100	0	0
Value of plant	45	0	0
Plant's total value	145	0	0
Add income	151	11	9
	£441	11	9
Deduct cash expenses	95	17	2
Actual profit	345	14	7

From eighty Muscovy ducks and thirty White Leghorn fowls for eleven months, the actual cash income (£55 14s. 7d.) will be about £1 sterling per week. The return, though showing a profit, would not have done so had full rations been given; in fact, the whole flock was upon a war-saving diet, and only two meals per day, consisting chiefly of a wet mash (one part bran, one part pollard, two parts chaffed herbage). The birds, though lean, have kept excellent health and vigour; therefore the problem of feed was solved during the high cost periods, still adhering to the war-ration, as I term it. I shall continue this course until poultrymen get their fair value, and a good article at reasonable prices that will allow them to raise larger numbers of birds, and enable Australia to be again replenished with good standard poultry, and not the utility class which is a cloak-word whereby all faults can be hidden, and a channel through which the advocates of the utility class can steer their bark of faulty fowls. I advise your readers to study what one hundred odd fowls can earn, through systematic practice, and still carry a new one hundred forward for the following year.

ABOUT INCUBATION.

Usually, incubation brings disappointment to an amateur, who generally fails with the first trial. The hopeful beginner buys a machine, unpacks it, and assembles the parts together with youthful glee, erects it in any spare space he can find, perhaps, for just temporary convenience, generally in an unsuitable building. He then scours the markets or the country for eggs and puts them into his new toy, fondly hoping that in three weeks or in twenty-one days he will have nine-and-ninety baby chicks to rear, and diligently carries out the instructions given in the book supplied by the manufacturer of the instrument. He trims his lamp, fills the water tank (if a hot-water machine), watches the thermometer carefully, which seems to keep pretty even registration, examines his eggs from time to time, turns them a couple of times daily as well as airing or cooling them; then he gets sorely puzzled as to whether they contain chicks or not; and as the twenty-first day approaches he hopes and hopes in vain, but his expected huge family does not appear. My own experience was thus sorely bought and I have had failures in machines which afterwards hatched most successfully.

Do not be disappointed if the above is part of your experience, as few succeed at first. Be a ''Robert Bruce—King of Scotland.'' Try, try, try again. Decide upon your programme for the year; secure your eggs for hatching from reliable breeders, and hatch early, as early-hatched chickens thrive best.

Do not be sad or downhearted by a failure, but, rather, keep plodding on. Of course, grit, determination, and will are sure, in the end, to conquer a great many initial mistakes. Be willing to work, quick to see and execute. Be patient in waiting and thorough in doing. Go into the business and you will win. Care of the incubator is a very important factor; you need to be extremely careful about its use. Do not think of selfish economy in its purchase, but wisely purchase the best of each article needed for hatching, be it machine, eggs, fuel, or brooder, then you will not grudge the initial expense.

CHICKEN-POX.

By J. BEARD, Poultry Instructor.

This disease affects chickens, pigeons, canaries, and turkeys; geese, ducks, and guinea-fowls are immune. Turkeys are very liable to contract it. As for fowls, their resistance generally varies inversely with the age of the bird.

The death-rate from the disease among chickens from two to three weeks old is very often 100 per cent., whilst with chickens two to four months old it is sometimes nil. Birds of pure breed are less resistant than their cross-breeds; Minorcas and Leghorns are the most susceptible varieties.

The infection can be either mild or severe, depending on the number, size, and seat of the nodules. At times the nodules are not bigger than a sorghum seed, and fall off without any treatment, the infection disappearing in a week's time without affecting the health of the birds. At other times they are very large in size; inflammation sets in through scratching, and the nodules become tumour-like. When the eyelids and angle of the mandibles are affected, the beak remains open, the bird being unable to close or open it. The inflammation soon reaches the mouth, which is covered by a thick, false membrane. The birds, being thus blind and unable to pick their food, soon become anæmic, emaciated, and die of starvation, or are poisoned by other germs which infect the nodules and the mucous lining of the mouth. This disease prevails in the summer months, the deathrate being heavy in January and February.

Chicken-pox is said to be highly contagious, though the causes of infection have never been clearly defined. It has also been noticed that the disease is most prevalent during dry seasons, and this gave rise to the conclusion that dust was the medium of infection and that the disease is transmitted from bird to bird.

This theory does not hold good when one considers that the disease may appear suddenly in localities where it was unknown before. It is evident, therefore, that the infection is carried through some other channel.

From observations made during many years, I am of the opinion that the infection is transmitted directly from one bird to another in exceptional cases only, but is more usually conveyed by a ''vector,'' which may be the mosquito, or any night-biting insect such as bugs, or sandflies, or the various fowl lice.

To prevent the disease from spreading, the healthy birds should be separated from the sick ones at night and placed in mosquito-proof cages.

TREATMENT.

There is no specific remedy known against chicken-pox. The best known remedies have never given any good results, except in mild cases which would have recovered more quickly had they not been treated at all.

Cauterisation, by means of metallic salts, generally increases the inflammation and should only be used in special cases, for example, when mouth and eyes are to be dressed.

My experience has shown that the less one interferes with the sickness the quicker is the recovery. The removal of the crust with a view to obtaining a rapid cure complicates matters, since the sores which were protected by their crust are thus exposed to further infection. It may, however, be necessary at times to interfere, in order to avoid ophthalmia or to prevent the false membranes from invading the mouth.

The false membranes arise from the nodules existing on the margin of the beak and at the junction of the mandibles. In such cases the crust, which must be previously softened with a lukewarm solution of boric acid, is removed and the sore coated with iodine by means of a brush. The false membrane of the mouth can be detached by means of a swab and the front painted with iodine and glycerine, or with some form of paint containing tannic acid.

PREVENTION.

During January and February avoid feeding the chickens with starch-containing foods, such as maize in any form, potatoes, or household scraps; supply a little fresh cooked meat once a week only; give a plentiful supply of green food and dry bran; give epsom salts once a week and add one teaspoonful of sulphur to the mash for twenty chickens once a week, the latter to be well mixed, otherwise some of the chicks would get more than their share, while others would be left without. Add Douglas's mixture to the drinking water once a week during normal times, and twice a week during sickness or moulting.

REMEDY FOR SCRUB TICKS AFFECTING DOGS, FOALS, AND CALVES.

The best specific for this trouble, so common in scrub country, is that given by the Chief Inspector of Stock, Mr. A. H. Cory, M.R.C.V.S., so far back as November, 1915, as follows:—

Scrub ticks cause a great deal of trouble to stockowners in certain districts, with a large percentage of mortalities. It has been stated that these ticks do not harm the animals during the first four days' attachment, so it is recommended that where scrub ticks are prevalent, valuable animals should be thoroughly examined every second or third day.

It has been proved that trypan blue—injected under the skin—is a specific for this disease in the dog; the paralysis soon improves, and in a few days the animal thoroughly recovers; one dose of the trypan blue is usually sufficient.

A 2 per cent. solution (about 9 grains to a fluid oz. of water) is made by dissolving the trypan blue in boiling water; a sediment falls as the solution cools, and this should be removed by filtering through a funnel in which a properly-folded filter paper is placed, or a fine piece of clean linen which has been previously boiled. The hypodermic syringe and needle, before being used, should be placed in a dish containing cold water, then placed over the fire and the water boiled for some ten minutes; this thoroughly sterilises the syringe and needle, which is now ready to use when the solution to be injected has cooled.

The injection can be made anywhere under the skin, but the best positions are either in front of the chest or behind the shoulder, the skin in these positions being loose a fold of which is easily caught up by the finger of the left hand, whilst the needle is inserted with the right hand. It is advisable to clip off the hair and disinfect the spot chosen before introducing the needle.

A dose for dogs, according to age and size, varies from 1 to 5 drachms, or 1 to 5 teaspoonfuls.

The dose for calves and foals varies (according to age and size) from ½ oz. to 2½ oz., or 1 to 5 tablespoonfuls.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1920.	Nov., 1919.
North Coast.	In.		In.	In.
Atherton	2·23	19	0·59	0·53
Cairns	4·15	38	4·66	2·26
Cardwell	4·24	48	2·87	1·08
Cooktown	2·84	44	0·97	0·37
Herberton	2·47	33	0·85	0·61
Ingham	4·02	28	2·27	1·27
Innisfail	6·23	39	4·89	1·23
Mossman	4·86	12	4·18	2·52
Townsville	1·90	49	0·73	0·16
Central Coast.				
Ayr	1·79	33	1·81	1·05
Bowen	1·34	49	1·15	0·53
Charters Towers	1·66	38	0·15	0·04
Mackay	2·96	49	1·92	1·47
Proserpine	3·24	17	1·46	2·27
St. Lawrence	2·40	49	1·48	0·61
South Coast.				
Biggenden	2·72	21	2·56	Nil
Bundaberg	2·64	37	2·17	0·63
Brisbane	3·70	69	6·28	0·38
Childers	2·81	25	2·29	0·12
Crohamhurst	4·65	25	5·54	0·58
Esk	3·12	33	5·10	1·09
Gayndah	2·83	49	2·59	0·33
Gympie	3·13	50	4·56	0·05
Glasshouse M'tains	3·61	12	5·62	0·04
Kilkivan	2·50	41	5·77	Nil
Maryborough	3·11	49	2·58	0·08

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of Years' Records.	Nov., 1920.	Nov., 1919.
South Coast—continued:	In.		In.	In.
Nambour	3·73	24	6·57	0 30
Nanango	2·60	38	3·05	0·65
Rockhampton	2·14	33	3·24	0·63
Woodford	3·09	33	6·25	0·50
Darling Downs.				
Dalby	2·55	50	1·62	0·48
Emu Vale	2·53	24	3·91	3·46
Jimbour	2·39	32	2·18	0.41
Miles	2·55	35	1·38	0·82
Stanthorpe	2·73	47	2·19	0·48
Toowoomba	3·24	48	6·06	0·77
Warwick	2·56	33	2·76	2·40
Maranoa.				
Roma	2·09	46	0·99	0·38
State Farms, &c.				
Bungeworgorai	2·19	6	0·76	0·53
Gatton College	2·67	21	3·33	0 65
Gindie	2·19	21	0·85	0·27
Hermitage	2·50	14	3·89	1·49
Kairi	2·65	6	1·18	0·40
Sugar Experiment Station, Mackay	2·70	23	2·33	1·28
Warren	3·20	6	3·85	0 55

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year, and for the same period of 1919, having been compiled from telegraphic reports are subject to revision.

GEORGE G. BOND, State Meteorologist.

Dairying.

DEVELOPMENT OF FLAVOUR IN BUTTER.

BY T. HAMILTON, M.A., N.D.A. (honours), N.D.D., Dairy Expert, Department of Agriculture, Rhodesia, S.A.

The faulty flavours in butter which must be guarded against are those commonly described as ''rancid,'' ''fishy,'' ''cheesy,'' ''cowy,'' ''stale,'' ''mouldy,'' ''musty,'' ''woody,'' and many which can be generally classed as ''unclean.''

A rancid flavour is one which often develops when butter is left standing either under ordinary conditions or in cold storage. It is one of the common faults in South Africa, both of farm butter and of creamery butter; but because of the difficulty of controlling temperature on the farm during the hot months it more frequently occurs in the case of the former than in the latter.

In ordinary creamery practice the flavours in the cream delivered to the factory are very varied, but a bad-flavoured cream, or one which will result in a rancid flavour being produced, is almost invariably caused by lack of cleanliness at some stage of the preparation of the cream for butter-making. Of course there are exceptions, which may be due to the cows eating some rank flavoured weed, especially in the early spring, when anything green and succulent is eagerly sought after, or which may be due to the inability of the farmer to cool the cream sufficiently to enable it to stand a long journey in the hot weather. Usually, however, when a consistently bad flavoured cream is produced at any particular farm, a general clean up will remedy the fault.

Rancidity in butter is not only due to a particular germ found in over-ripe or fermented cream, but it is also due to the butter being insufficiently washed. During the hot weather it is most difficult to get a good grain, for the normal temperature of the cream during the hot weather often exceeds 70 degrees F., and it is very difficult to get washing water below this temperature. The consequence is that the butter is soft, and it is almost impossible to wash the buttermilk out of the butter. Carefully churned and well washed butter contains an extremely small proportion of curd or nitrogenous matter on which germ life can thrive, consequently such butter, provided it is kept under proper conditions of temperature and surroundings, will retain its good flavour almost indefinitely. However, if for reasons outlined above a large proportion of buttermilk is retained in the butter, this nitrogenous matter is likely to be attacked by bacteria which will cause a rancid flavour to develop in two or three days. Therefore butter made in the height of the season, when cream is plentiful, and when the temperature both of the atmosphere and of the water is high, should never be stored, but should be disposed of as quickly as possible. The alternative is, of course, to send the cream during the hot months to a creamery, where the temperature can be controlled, and where the butter made can be stored under almost ideal conditions.

''FISHY'' FLAVOUR.

This is one of the commonest faults to be found in creamery butter which has been stored for a considerable period awaiting sale or export. In Australia, as in South Africa, the development of this flavour causes losses amounting to thousands of pounds annually, and many investigations have been undertaken to account for this particular taint. It is generally attributed to the feeding of rank herbage, such as is found on the coastal belt, and also to cream being ripened to a high degree of acidity before being churned.

The writer has frequently observed the development of a ''fishy'' flavour in butter in cold storage where the temperature varies from day to day. Nothing is worse for the keeping qualities of butter than constant variations in temperature, and it is essential that as low a temperature be maintained as is possible. If the temperature of the cold store rises above 30 degrees F., ''fishiness'' develops, and becomes more pronounced as the temperature rises. The best temperature at which to store butter in cold storage seems to be from 5 degrees F. to 15 degrees F., and critics of South African butter are unanimous in their opinions that the lower the temperature at which the butter can be carried, the better the flavour when it arrives on the London market.

''CHEESY'' FLAVOURS.

These flavours are generally due to the decomposition of the proteid matter retained in the butter. Such butters generally are streaky, the white streaks being due to caseous matter being left either through neglecting to strain the cream before chrurning or through neglecting to wash the butter sufficiently when in the granular stage.

"UNCLEAN" FLAVOURS.

are self-explanatory, and if the cause is removed and the cream properly treated none of these objectionable taints need be developed.

"WOODY" FLAVOURS

are caused either by improper treatment of the cream or by bad packing. There is a great dearth of wood suitable for butter boxes in South Africa, and almost all boxes are imported from Canada or Sweden. Some experiments have been tried with boxes made of South African timber, and the boxes have been treated by painting them on the inside with melted paraffin wax and other materials, but up to the present these experiments have not proved a success so far as the export trade is concerned, and the more expensive imported box has come into common use. There is a wide demand for butter boxes in the Union and Rhodesia, as the annual consumption must exceed a quarter of a million, and if this demand could be met by utilising some of our native timbers, a great saving would be effected and a substantial sum of money retained in the country. The extent of this saving can be easily calculated, when it is realised that an imported butter box costs approximately 4s., and that no allowance is made for boxes when butter is exported.

"MOULDY" AND "MUSTY" FLAVOURS.

are generally due to neglect in storing the cream or through keeping the lids of the cans firmly closed whilst waiting for despatch to the creamery. It is remarkable how many farmers neglect the elementary precautions necessary for the production of good flavoured cream, and how many cans of cream are received at a creamery the top of which is covered with a thick growth of green mould. This green mould would never develop if the can before being despatched to the creamery was regularly stirred and allowed to stand in a cool place covered only with a damp muslin cloth.

"FEED" FLAVOURS

are very common when the grass is rank, especially on the coastal belts. At such times and in such districts it is almost impossible to make a first grade butter for export, as the taint seems to develop with age. When the practice of the winter feeding of dairy cattle, now only too rare, becomes more common in Rhodesia, we can expect more of these taints. When silage, rape, or other rank-smelling feed is given, it is always preferable to give it to the cows after the operation of milking is complete. It is equally important that every precaution should be taken to have clean stables and a pure atmosphere whilst milking is taking place.

"COWY" FLAVOURS

are generally the result of unclean stables and the use of "colostrum" or "beastings." No milk from a newly calved cow should be mixed with other milk until at least eight days have elapsed from calving.

"STALE" FLAVOURS

can be caused by keeping the cream too long before churning, but a more frequent cause in South Africa is the use of rusty cans and other receptacles. The danger of the use of these cans is recognised in all dairying countries, and under the Dairy Act of the Union powers are given to inspectors to destroy such cans if their use is persisted in. There can now be no excuse for a farmer using rusty cans, as there are various factories and re-tinning plants in South Africa, where cans and other dairy utensils can be repaired and made almost equal to new. This is a great consideration when the price of all dairy utensils is so high, and full use should be made of these factories by the dairymen of this Territory.—"Rhodesia Agricultural Journal."

MOLASSES AS A FOOD FOR MILKING COWS.

A correspondent asks for information concerning the merits or demerits of sugarcane molasses as a food for milking cows. The Government Dairy Expert, Mr. W. E. Graham, says:—"I have to advise that sugarcane molasses has a comparatively low value as a feed for milch cows. Molasses may be accepted as being rich in carbo-hydrates, but it contains a very small percentage of protein, and it is the latter constituent in a food that enhances the value of it for dairy stock. However, molasses is frequently found serviceable for the purpose of adding to the palatability of rough feeds, and consequential to the addition of molasses to the rough class of feeds, these are more readily partaken of by stock. Further, molasses exerts a laxative influence upon stock, and this is advantageous when dry, fibrous foods are fed. As you have not given details of the feeds which comprise the rations in which molasses is included, no opinion can be offered as to whether the molasses would be of value in your particular circumstances.

Tropical Industries.

COFFEE CULTIVATION IN QUEENSLAND, NO. 2.

By T. A. BROMILEY, Instructor in Coffee Cultivation, Department of Agriculture and Stock.

Coffee is a hardy shrub, but there are certain conditions which must be observed if it is to be cultivated for commercial purposes. First, there must be freedom from frost. Coffee will do its best at temperatures ranging from 60 deg. to 95 deg. Fahr., but will not suffer in the low 40 deg. Fahr. if not too long an exposure. It will also stand much higher temperatures than 95 deg. Fahr. if there are occasional falls of rain. This mention of rain is, of course, in consideration of crop. The tree will resist drought as well as any fruit tree grown in Queensland. Naturally, however, long spells of dry weather militate against the crop, as is the case with any other shrub or tree.

Strong, continuous winds are inimical to the plant, therefore the site selected for its growth should be determined to some extent by the direction and intensity of the prevailing winds of the district. In some areas, the S.E. winds are very trying, and it would be well to avoid exposure to such winds, if possible. In most districts of Southern Queensland, at any rate, north-east, north, and north-west aspects are good unless some unusual local feature exists.

Undulating land is better than flat land in that it, generally speaking, drains better—an important feature, as good drainage is absolutely necessary to the health of the tree. Where natural drainage is not good it must be made so artificially. Hillsides suit coffee well, but they are liable to wash in heavy rains, unless there are plenty of rocks and boulders, to which the tree does not object, and soil enough to get its roots well into. Remembering this fact, many a piece of land, quite unsuitable to horse work, could be turned to profitable account.

Any fairly fertile land suits coffee. Red volcanic is among the best, but, as a rule, it is very porous and soon feels the effect of a dry spell of weather. When the trees have attained their fourth year of growth, however, they cover the ground so completely that evaporation from the soil is much mitigated and the roots have got down to the normal moisture level. Scrub lands, especially the foothills of scrub-covered volcanic ranges, are the best possible for coffee, provided, of course, that there is a fair rainfall, which there usually is in such localities.

Not only does the plant accommodate itself to varying qualities of soil, doing well in most, but it as readily adapts itself to proximity to the sea, or long distances from it. But, from the writer's own observation, it succeeds best at distances of 1 mile to, say, 20 miles of the sea. As has been said, good crops have been taken from trees growing not many yards away from salt water, and only a few feet above it.

Having now reviewed the necessary conditions for the successful production of coffee, in a very brief manner it is true, the next consideration is the obtaining of plants. This involves the procuring of seed and making of a nursery bed.

For the bed, select a slightly sloping site. Dig the soil well to a depth of 12 inches, removing all roots and stones, if such there be. Rake well and finish off smoothly. Dig a shallow trench on the highest side, a little above the bed to carry away excess of rain. Make the bed, or beds, 3 feet wide so as to be able to reach conveniently from either side for weeding, if necessary. Paths between beds should be 18 inches wide to facilitate walking with a watering-pot if irrigation becomes necessary, as in most districts it will. The bed must be shaded in the following, or similar manner:—Procure a few forked ''sticks'' about 6 ft. 6 in. long to bottom of fork; erect these around the bed, leaving them about 5 feet out of the ground. A few light, straight saplings placed in the forks connecting the whole will make a frame, upon which lay a few leafy branches. On them, again, place several light saplings to prevent the branches being carried away by the wind. This shade should extend to 18 inches outside the margin of the bed in every direction. It must be remembered that the cover is only to be partial. If leafy branches are used the leaves will probably begin to fall about the time the seeds will be showing through

the soil; for that reason wattle branches answer well. The bed, &c., now being ready, proceed as follows:—

Line with a string, or mark with a straight stick, lines across the narrow way of the bed 3 inches apart. Dibble the seeds in to the depth of 1 inch, following the lines and spacing them about 3 inches one from the other, along the mark. It is well to put in a little peg at the beginning and end of each line so that the seeds may not be disturbed if it is found needful to prick up the surface of the bed before the seeds germinate. It is perhaps needless to say this pricking-up must be very lightly done, and only between the lines, not near the seeds. The germination of the seed will take from four to six weeks, depending much upon the weather. During the whole of this time the bed *must be kept moist*, if rainy weather supervenes, then less artificial watering will be needed. The soil must not be drenched, but, to reiterate, it must be kept moist till the seeds appear above ground. A finely perforated rose should be used for sprinkling. A covering of some sort of short mulching laid on the bed to the depth of about half an inch would, in some measure, prevent the packing of the soil by watering. Chaffed blady-grass, being free from seeds, would do very well. But if shade and watering be attended to, mulching will not be necessary. The young plants will be ready for the field by the time they have attained a height of 9 or 10 inches. This will be when they are about 9 months old. In practice this would mean the succeeding spring of the year. The distance apart of the plants in the field will vary a little according to the quality of soil. If the latter is only moderately fertile, 7 feet by 7 feet apart would be found about right. In good rich soil the plants should be 8 feet by 8 feet apart. In setting out the field for planting, lay off the base line, and set out the first line at right angles from it. Make the first hole for planting on the base, at the point of contact of the two lines. Now lay off the second line 8 feet from the first line, but instead of holing on the base line, measure off 4 feet from it along the second line. Proceed in this manner till the last line is reached. The trees will then stand alternate to each other throughout the plot. The holes to receive the plants should be made 18 inches each way—that is, in length, breadth, and depth.

In removing the soil, place the top half to one side and the lower half on the other side. It would be well to break up the bottoms of the holes with a spade-bar before filling in the soil that has been removed. In replacing the earth in the holes put in the surface stuff first; it is a good plan to rake in enough of the surrounding surface to fill up the hole, spreading the soil from the bottom of the hole where convenient. If the soil is good from top to bottom, then all can be restored to where it was removed from. The excavations should all be filled in, and the position the tree is to occupy marked by means of a stake or peg. If the plot to be planted is fairly level the lines may be easily spaced by means of three lining rods, and a correctly marked staff—8 feet in the instance now being considered—to indicate the position for the plant. A stake must be placed where shown by the measuring staff. If this is carefully done the trees, when established, will show lines in several directions, and facility of working with horse tools, as long as that may be safely done, be secured.

The operation of planting may be eaid to be the most important work in connection with the establishment of a coffee field. Planting, badly performed, can never be remedied; therefore, great care should be exercised at every step, and the recompense will be sure.

In removing the plants from the seed bed, be careful not to break the taproot if it can possibly be avoided. To reduce this risk to a minimum, carefully dig a trench in front of the first row of seedlings to a depth of 9 or 10 inches; it need not be wider than the spade can be worked in. Now insert the spade perfectly vertically in the mid-distance between this first row and the one nert behind it. Pull the handle of the spade so as to cause the plants to lean somewhat forward. Release the spade and insert again the width of itself in advance, and so on, to the end of the line the narrow way of the bed. If the spade be now carefully passed under the plants at the bottom of the trench, 9 or 10 inches down, and the plants pressed forward with the right hand on to the spade, they can be lifted with ease and the least possible risk of damage. Place the plants in a basket, or box, or, better than either, in a light barrow for transport to the field. Keep them covered from the sun with a sack. Keep as much soil as possible about the roots when removing them from the seed bed.

From the centre of each place intended for a plant remove as much soil as will easily accommodate it without cramping its roots. In particular, see that the taproot is kept perfectly straight. Hold the plant in position with one hand; with the other, draw in sufficient loose soil to fill to the surface, taking care to fill in well about the laterals, which must be kept as nearly as possible to the ''lay'' they assumed in the seed bed. Holding the plant firmly, now pour round it enough water to settle the

soil among the roots. Do not allow the plant to sink lower (as it would have a tendency to do under the watering), than a couple of inches below the general level of the surrounding surface. Do not use the boot to press the soil about the plant; the grouting in with the water will have settled the earth better than any foot pressure could. Shade the plants from the mid-day sun till they "take hold." A broad shingle or two thrust into the soil on the northern side, with an inclination over the plant, will do very well, but, if shingles cannot be procured, leafy branches may be used. When the young trees have attained a height of 12 inches they must be staked to prevent their being blown over by strong winds. The coffee plant does not make many surface roots till three or four years old; consequently, they are likely to suffer severely by being blown about, especially in the gales often accompanying our summer rains. In well-sheltered positions staking may, perhaps, not be necessary, but in most localities recourse must be had to stakes. As these latter may have to stand for a year or two they should be of timber that does not quickly rot. Split hardwood is the best, of course, but there are other timbers which would answer the purpose, no doubt. Knowing the object to be attained, the planter will select suitable stuff. The stakes, if of hardwood, should be 1½ inches by 1½ inches, and about 3 feet 6 inches long, and be driven a foot into the ground. Some planters use but one support, by which method the tree may be saved from being blown down, but certainly does not prevent it being lashed about, and, possibly, seriously injured. Two stakes driven firmly in, one on each side of the tree at a distance of, say, 10 inches from the stem, and placed in such a position as will sustain the tree against the prevailing winds, is by far the best method. Manila or coir lashing may be used for tying up; any soft, strong material will do. These lashings will need examining at intervals to see that the knots at the stems have not unduly tightened nor worked loose, and to replace any that may have broken either from strain or decay. Another plan which worked admirably, but needed care, was to take two or three turns of ti-tree bark around the stem, then take a length of No. 16 gauge galvanised wire, enough to reach from one of the stakes to the tree and back again to the stake; add to this length, enough wire to allow of tying. Double the wire in the middle, but not closely. Pass the bight round the stem of the tree. Twist the two sides of the wire together, but only just tight enough to dent the ti-tree bark with which the tree is shielded. Finally, secure the wire to the stake in a manner that it will not slip. Proceed in the same way on the other side of the tree and the job is done. In twisting the strands of wire, see that they engage each other, not one strand straight and the other coiled around it. If this work is properly done it will last as long as stakes are needed, but the tyings must be examined occasionally and loosed if they have become tight. There should be at least half an inch in thickness of bark round the tree. Keep the wire bands about two-thirds the height of the tree from the ground.

When the trees have grown to 4 feet 6 inches, or 5 feet in height, they must be "topped" or headed in. Perhaps the best height is 4½ feet. Cut down to within 1 inch of the first pair of primaries below 4 feet 6 inches. After pruning off the head, there will appear several suckers, perhaps half a dozen, shooting out from the first, second, and, perhaps, the third pair of primary branches. These must be rubbed out, or plucked out, as they appear. Sometimes this suckering will go right down to the bottom of the stem; all must be plucked off. One object of topping is to strengthen the lower limbs and fill in the tree. Coffee left to itself would grow tall and spindly, the lower branches would die out, and the top be clothed with a few green leaves on slender whip-like branches. Heading-in prevents this undesirable condition and throws the energy of the tree into the development of its lower parts, giving it spread of branches, thus shading the ground, and, of course, producing the crop where it can be easily gathered.

The matter of pruning, how and when to do it, is a question upon which there seem to be many opinions by coffee-growers in coffee-producing countries. So far as Queensland is concerned, the writer's long experience with the crop has convinced him that much pruning should be avoided; indeed, the less the better. But Queensland's rich soils and congenial climate encourage such an exuberance of growth in coffee that a certain amount of training becomes necessary to keep it in shape for profitable handling, &c., &c.

The first and perhaps the most important step in pruning is to open the centre of the tree. This is done by removing all branches from the primaries growing within 6 or 7 inches of the stem. By this means a sort of cylindrical space is made into which sunlight can penetrate, and through which the air can circulate. This is not only good for the health of the tree, but flowering is induced well inwards on the branches, and picking of the crop is much facilitated. Opening the middle of the tree to light and air sometimes causes a few branches to shoot directly backwards; needless to say these must be pulled out, also any branches growing vertically upwards or downwards. It happens at times, particularly when the tree is young,

and in vigorous growth, an errant branch will take a course right across the adjacent limbs. They are usually very thin, and the flowering notches far apart; pull them out as soon as discovered, as they only crowd the tree, draw sap from some other limb where it had better be allowed to flow, and they hamper the tree for picking.

On a primary there will sometimes develop a sort of notch or excrescence out of which dozens of shoots will come, and form what is called a ''crow's nest,'' an appropriate name. Cut out the primary immediately at the back of the ''nest.'' From the nearest eye to the stump will grow two or more shoots; remove all but one. With care this can be trained to assume the position that was occupied by the severed branch. If the tips of any of the primaries die, as they sometimes do, from overbearing, or from spells of drought when heavily laden with fruit, cut back to where the branch is green—that is, not dried up. Break out, or cut out, any dead wood as it makes. This, however, is not likely to appear till after some years of bearing, if the tree is growing under favourable conditions, and has had fair attention.

The foregoing directions for pruning, it is thought, will be sufficient for general purposes, but the observant grower may find occasion for a more free use of the knife, but, as has been said, pruning should be kept to a minimum.

The cultivation of coffee is in some respects different to that of any other variety of fruit. Until the tree is nearing its third year, light scarifying may be practised, keeping the implement outside the reach of the limbs. Nearing the fourth year, surface roots begin to occupy the ground; to wound these is to seriously injure the tree. Light chipping with the hoe is best, but on no account should a cutting tool enter the ground under the shade of the branches. If the trees have been looked after their own shade will prevent much weed growth, but if weeds have got under the branches, pull them out by hand. Weeds chipped from between the trees may be pushed under the branches, using care not to contort the latter. If the grower will examine the ground under his four-year-old trees he will find it ''choke full'' of fine roots. These are the fruit-producing agents, to injure which is to, more or less, reduce the size of berry and quantity of crop, and, eventually undermine the constitution of the trees.

In ordinary cases coffee flowers in Southern Queensland from mid-October to the first week in December; this may vary considerably with the character of the season. If good-growing weather, flowering may commence as early as the beginning of October and continue till the middle of November. If the season has been dry, flowers may not show till mid-December, and then only partially, but such late flowering does not often occur. Coffee makes the best of a small amount of moisture.

In the same localities as abovementioned, the berries begin to ripen in late May or early in June, and, usually, picking is finished by mid-September. Picking, however, is not continuous during this period. The early ripening, being small, is off in about a fortnight, then there is a spell of two to three weeks before pickers need go into the field again. This, the second picking, is the heaviest of the season, the weight brought in being equal to three-quarters of the season's crop. If picking has been delayed from any cause such as wet weather or shortage of pickers, there will be no break in field operations till the last of the crop is housed, which will be, in normal seasons, about the latter half of September. Under unfavourable conditions, such as a delayed start, or drought conditions, the last of the crop may not be got in before mid-December, but this very rarely happens.

Pickers are provided with bags or pockets tied around the waist and suspended from the shoulders by bands. These bags are best made of stout sail cloth about 10 inches wide and 8 inches deep. Make the back of the bag—*i.e.*, that part touching the body, 3 inches deeper than the front, turn down a hem of 1 inch, through this hem place a thin piece of wood reaching across the cloth but protruding from the ends of the hem, and fasten the pocket to the lath by means of a copule of tacks driven in at the extremities. This prevents the bag wrinkling up. Sew in a gore at each side, about 1½ inches wide at the top. Such a pocket holds 5 or 6 pounds when full, quite heavy enough for convenience. Empty kerosene tins fitted with cross-handles are very suitable for carrying the berries in to any place where there is a larger receptacle to be wheeled in to pulping house, or may be carried in by the packers to the place of weighing. Such a tin, full length, holds, when full, 28 to 30 pounds of berries, according to the season. The berries are ready for picking when they assume a bright red or purple tint. Soon as the beans in the berry will move one upon the other when pressed firmly between the thumb and finger, picking may commence. The bright red berries are known by growers as ''cherry,'' from their resemblance to that fruit.

This ''cherry'' skin or covering has to be removed by means of a machine of simple construction called a pulper. There are various contrivances used for the

purpose. A fairly effective method for small quantities is to pass the "cherry" between two wooden rollers geared together near enough to squeeze out the beans without crushing them. Under the rollers, place half a barrel nearly filled with water, place a sieve of half-inch mesh on a couple of laths resting on the edge of the tub or barrel. If water is fed with the cherry it helps the separation of the beans from the skins or "pulp." It will be needful to shake the sieve frequently. As all the beans may not have fallen through the mesh, throw the skins aside to be passed through water in another barrel. The beans will descend to the bottom by gravitation; the floating pulp may be thrown away. This method would never do where many hundredweights daily had to be worked, and is only mentioned for those with only a few trees, or for trial where there is no machine within reach. The two principal systems adopted are the disc and the breast-pulpers. The former is an iron disc revolving vertically. This disc is covered on one or both sides with copper, upon which are embossed rounded protuberances of various shapes; in some machines rounded, in others oval, and in still others, crescent-shaped. These elevations are close together and raised about one-eighth of an inch. The cherry is placed in a hopper from which it is guided by a cast-iron chop on one or both sides, placed near enough to the disc to crush the berries, but far enough off to allow the skin to pass between it and the chop. The cleaned-out beans escape in another direction. The "breast" pulper is a cylinder or drum 12 inches face and about the same in diameter. This drum is covered with copper, perforated something like an arrowroot grater, or with similar-shaped knobs to the disc pulper. The drum is mounted on a strong frame; in the front of it, and resting on the frame, to which it is fastened with bolts, is a bar of iron presenting a square face to the drum of about 1½ inches. The opposite side of the bar is chamfered away, leaving the thin edge on top. This thin edge is perfectly level and kept sharp. When pulping is proceeding, this lower chop is placed near the face of the drum, so close as to allow the skin to pass, only, say, not further away than one-sixteenth of an inch at most; generally a little less will do. If the distance between the chop and the cylinder is too great, the beans would be liable to be damaged. Above this chop is fastened a second chop, or "breast" bar, the lower edge of which is placed above three-eighths of an inch above the sharpened edge of the lower chop, its width is usually 4 or 4½ inches, the face against the drum, square, and closest at the lower edge, close enough to ensure the crushing of berries passing between it and the drum. A hopper is fixed above the drum, into which the "cherry" is placed. A chute is provided to convey the berries to the open space between the upper edge of the top chop and the drum; the latter, revolving, draws the berries downwards, the beans passing out from between the chops and the skin passing down behind the lower chop and along a chute to the back of the machine. The beans fall into a perforated sieve, the holes being large enough to pass the beans but to retain any unpulped beans and skin which must be returned to the hopper to go through the machine with fresh "cherry." For good, clean work, pulping should be done on the day of picking, or next day at latest. Water must also be freely used with the berries in pulping to facilitate the separation of the beans from the pulp, &c. Between the outer red skin and the inner "parchment" is a quantity of viscid matter which must now be got rid of, or the coffee would not dry properly. It would be sure to become mouldy and spoiled for sale. To remove the above viscid substance, the beans must pass through a fermenting process, which is accomplished in the following manner:—

The beans, fresh from the pulper, are placed in a receptacle such as a wooden tank, box, or barrel. After twenty-four hours or so, acetous fermentation should have converted the viscid substance into a vinegary sort of fluid, easily washed away from the coffee. The time needed for this change, however, will vary with temperatures. If the weather is cold, the writer has found the addition of a little warm water, and covering the vats with a few sacks, advantageous. To ascertain when the coffee is ready for washing out, dip out a quart or so from one of the vats and wash it well with clean water; if, after so washing, it is found to feel "gritty," having lost all feeling of slipperiness, it may be washed out. The cleansing should be continued till the water comes off quite clear. Remove all floating beans and skins, if any, by means of a skimmer, or they may be rushed over the end of the washing tank, or vat, into an empty vessel placed to receive them. After washing, the coffee must be placed in trays having bottoms of small-mesh woven galvanised wire, or perforated zinc, and sides of 3-inch wide pine battens. Stands for the trays may be made by driving stakes firmly into the ground at suitable distances apart, perfectly in line, and quite level, one with the other, on the tops. The lines should be in pairs, placed sufficiently far apart to carry the trays, allowing for 2 or 3 inches projection at each end of the trays for convenience of lifting. Nail a 3-inch batten to the stakes, edge up, along the top of any convenient length, say, 15 feet. This can be repeated, of course, to accommodate any number of trays. A shed or cover of some sort should be near the stands under which to place the coffee at night or in case of rain.

During the process of drying, the coffee should not lie deeper than 1 inch to 1½ inches on the trays; if there is no stint of the latter, and there is drying room enough, it would be better to spread the beans down to less than 1 inch in depth. To ascertain when the coffee is dry enough to be taken into the store, try a bean or two by pressure of the thumb nail, or between the front teeth. If either make an indentation, it is not quite ready for housing. After a little experience, the stage of dryness may be judged by the colour, which should be an even, slaty blue, but the thumb nail and teeth first, the other will come by practice. It sometimes happens, through unsuitable weather, and shortage of trays, that the coffee must be taken in. This may be safely done if the beans have shrunken from the parchment skin, and are spread thinly on the storeroom floor, and turned over daily till an opportunity offers of completing the drying in the sun.

It usually takes six or seven consecutive days of sunshine to thoroughly dry the coffee, during which time it must be frequently turned not less than three or four times daily. This ensures even drying, and will gain fully a day in the time of its exposure; it also secures other desirable ends.

The next and final stage in the preparation of the beans for the market is ''hulling'' or peeling—that is, the removing of the ''parchment'' and ''silver'' skins. This latter is a fine tissue lying between the parchment and the bean. There are several ways of accomplishing this removal of the covering of the beans. One way is to bruise or crush it off under a revolving roller fitted in a basin very similar to a mortar mill. Care is taken that the roller, or wheel, does not come into immediate contact with the bottom of the trough or basin. Another machine for the purpose, and the one in general use, is constructed much on the principle of an ''Enterprise'' meat mincer, a tapering spirally corrugated cone revolving in a similarly tapering and corrugated cylinder. The coffee is fed into this cylinder and forced forward to its smaller end. Much pressure and friction is exerted. A spring or weighted valve is fitted at the exit, through which the hulled and polished beans pass. A fan blows away the chaff. The beans are then passed through a grading machine fitted with a series of sieves. It is here graded into sizes, the pea-berry separated from the ''flats'' and any broken beans removed. This operation finished, the coffee is bagged, and is ready for market. Hulling, grading, and especially the difficulty of getting the coffee beans into a market where they could be placed before buyers of quantities, have acted as deterrents to the progress of coffee cultivation. These obstacles the Minister of Agriculture now proposes to remove if possible, by taking the coffee in the ''parchment'' stage from the grower, making a cash advance upon it; marketing the beans, and, after bare expenses are provided for, handing the difference between the sale price and the cash advanced to the grower.

In the foregoing pages it is not claimed that all is said about coffee-growing, &c., that can be said. The writer's aim has been to avoid redundancy of words and yet make plain as possible what was considered essential to assist and guide the would-be coffee-grower. Nothing has been put forward that has not been tested during nearly thirty years' experience in Queensland. Naturally, there will be differences in details in different localities—meteorological conditions, differences in quality of soil, situation of plantation, &c. But general principles of cultivation, &c., are the same pretty well all over this State.

It must also be borne in mind that what has been written has been intended for the small grower; hence no elaborate calculations as to the cost of establishing a big estate have been given. For one reason, it would not be advisable to open up extensively for coffee unless an adequate supply of suitable labour could be depended upon for picking. A small farmer could easily add 2 or 3 acres of coffee to his cultivation with the help of several juveniles for the harvesting only, and, as stated, it is with the especial object of assisting such men that this article has been penned. At the same time, anyone in a position to do so, and wishing to go into coffee-growing extensively, may depend upon the accuracy of its details, with the added value to Queenslanders that the information imparted has been accumulated in Queensland.

THE NORTHERN CANE FIELDS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

The following areas have been visited during November, 1920:—

PROSERPINE.

Taking this district right through, the cane is looking fairly well. The young plant cane is very healthy, and the majority of the growers are well satisfied with their prospects for next year. A good run has been experienced with the harvesting operations.

Of the varieties that are growing at Proserpine this year, Q. 813, Clark's Seedling, Badila, and 1900 Seedling appear to be making the most satisfactory progress. If the first-named cane continues as well as it has grown to the present, big crops ought to result from this variety. Badila, as is usual in the tropical areas, is doing well, free from disease, and showing that it is still remaining true to original type. The other two varieties, Clark's Seedling and 1900 Seedling, are not quite so satisfactory. There is evidence of disease in these canes that is not going to do them any good in the future. On close examination of the 1900 Seedling, two distinct types of leaf disorder were observed to be infecting the cane. The first appeared in the form of yellow stripes running longitudinally in the leaf, with green stripes running between them. Occasionally the entire leaf was white.

Other cane examined revealed, in the second place, a far more insidious form of disease than the chlorotic condition mentioned above. Upon close examination the leaves were observed to be spotted with irregular light-coloured patches on the leaves. The cane had a sickly appearance, with attentuated nodes and cracks on the internodes, longitudinally and diagonally. Small roots were shooting out at the nodes high up from the ground. The primary symptoms are similar to the striped leaf disease which usually affects B. 208, but which I have never previously observed in 1900 Seedling.

Great care should be taken by the growers who have cane attacked in this manner. No plants should be selected from affected areas, and growers who have clean plantations should carefully observe the behaviour of the cane and destroy any that show symptoms of this disease. It is very infectious, by working this way downward in the cane. Clark's Seedling is, in places, attacked in the same manner as 1900 Seedling, and similar precautions should be taken with this variety. There is no desire to infer, however, that disease is materially affecting the cane in the Proserpine areas; it is quite the contrary, but close examination will reveal the above condition in 1900 and Clark's Seedling. Proserpine looks very green at the present time. The roads are in good order, and the extension of the Silver Creek tramline is a source of satisfaction to growers, who hitherto had a long way to haul their cane on wagons. Every farmer is looking forward to greater prosperity next year, and the mill expects to be working at its utmost capacity.

HERBERT RIVER.

The farmers here are probably making the most whole-hearted attack on their farming problems at present that they have done at any time in their planting careers. The present season has been a good one and better things still are expected next year, when, judging by the areas planted, the mills should be taxed to their full capacity.

Cane pests are giving the grower in this district a fair amount of trouble, especially the borer and grub. The latter is at its worst in the vicinity of scrubs where the emergence is uninterrupted by ploughing, &c. If practicable, all these small patches of jungle close to farms should be cleared and some product grown in them. If the pest is sufficiently harassed during the pupating and developing period there is probably not such a large emergence as if left alone in scrub areas.

The principal varieties growing on the Herbert River are Badila and Clark's Seedling. There are a number of other canes growing, however, most of which are

distributed here and there on the farms in unimportant quantities. Careful selection of plants is very necessary on these areas. In view of the prevalence of borer and the incidence of gumming the growers cannot be too careful in getting the best and healthiest cane for their plants. With regard to gumming, the disease is fatal if not watched, and the bacteria which attack the vascular bundles of the plant work into the ground and keep attacking susceptible varieties, if care is not taken to select healthy cane of a variety that is, if not immune, highly resistant.

Of varieties that were not observed growing, Q. 813 and 855 should both do well on these areas. Soil conditions and methods of agriculture are the same as when last reporting on this place.

Very little labour trouble has been experienced during this year. Supplies of cowpea and mauritius bean seed are not yet available in suitable quantities for the farmers. Many of the growers are anxious to plant green crops, but are hampered with the difficulty of getting the seed. It would be highly beneficial to have plenty of vegetable matter in the soil, thus giving it greater powers of water conservation, and as much of the soil is poor in available plant food these green manures would largely help to restore deficiencies.

INNISFAIL.

Considerable rain fell during the time of visiting Innisfail, and consequently field work was interrupted. The growers have had a good run this season, the cane cut being of fair weight and sugar content, while the growing crop looks very fine indeed. The ratoon crop is very gratifying as well, particularly the Badila first ratoons. Clark's Seedling is covering a fair quantity of land, but does not promise as well as the first-named variety. Symptoms of leaf disease are apparent, and growers need to watch this variety carefully. It would be advisable here, if possible, not to ratoon this cane more than once, and carefully select plant cane for planting out. The introduction of D. 1135 from southern latitudes might be beneficial at Innisfail, say, for instance, a quantity of healthy plants from the Maroochy River. Q. 813 and 855 might also be profitably grown here.

Cane pests are not giving the growers much trouble. In the case of attack by grubs, arsenic might be used, but this nuisance is not present, at least this year, in sufficient numbers to cause alarm. Probably the large amount of ploughing and cultivating earlier in the season had something to do with this, having the effect of destroying habitation and interfering with the life cycle of the grub. Growers here, especially those operating at distances from the river, would be well advised to devote energy to planting green manure crops.

This area is probably the best cane district in Queensland, and the growers should in a few years be in a position to do more experimental agriculture. Farmers are using mechanical traction to a considerable extent around Innisfail, as well as other labour-saving devices.

SHEEP COUNTING.

A shepherd of the old school may be unable to count in the ordinary way, yet may keep a good reckoning by tallies, or by the old-fashioned sheep-counting scores. A flock tally is a short length of wood with notches representing twenties. Old-time sheep-counting scores exist in many forms in different parts, some of them going back 200 years, remnants of the ancient British scores. Here is a modern set detailed in the *Morning Post*, which still holds good with some of the older shepherds in Lincolnshire:—

1. Yan.	11. Yan-a-dik.
2. Tan.	12. Tan-a-dik.
3. Tethera	13. Tethera-dik.
4. Pethera.	14. Pethera-dik.
5. Pimp.	15. Bumpit.
6. Sethera.	16. Yan-a-bumpit.
7. Lethera.	17. Tan-a-bumpit.
8. Hovera.	18. Tethera-bumpit.
9. Covera.	19. Pethera-bumpit.
10. Dik.	20. Jiggit.

[This is apparently an old Welsh notation: the same words are used to the present day in Wales for the numbers up to 19; 20 was called ''ikian'' or ''dikian.'' —Ed. Q.A.J.]

Botany.

THE PONGAMIA TREE (PONGAMIA GLABRA): A USEFUL FODDER TREE.

BY C. T. WHITE, F.L.S., Government Botanist.

Description.—A small or medium-sized tree. Leaves imparri-pinnate, each leaf composed of 5-9 smooth, glossy, green leaflets; variable in size but averaging 2-3 inches long and 1-2 inches broad, elliptic lanceolate. Flowers in racemes in the leaf axils. Racemes 2-5 inches long, bearing 20-50 flowers; flowers pleasantly scented, 5-6 lines long on pedicels about 3 lines; calyx broadly cup-shaped, brown, clothed with short brown hairs, petals lilac-coloured. Pod 1¾-2 inches long, woody; seeds 1, rarely 2, brown, flat, somewhat kidney-shaped, about ¾ inch long.

The flowers are often galled by insect agency, producing round berry-like galls.

Distribution.—Widely distributed throughout tropical Asia, the Seychelles, Philippine Islands, Malay Archipelago, Polynesia, and tropical Australia.

Use as a Fodder.—Writing under date 9th June, 1920, Mr. N. A. R. Pollock, Northern Instructor in Agriculture, in forwarding specimens of Pongamia stated:—"The foliage of this tree in the drought of last year was found of great value as a fodder for cattle." This was very interesting to me, as the tree is known to possess poisonous properties, and I had not previously heard of its being used as a fodder. On looking the matter up, however, I found several references to the leaves as a fodder for cattle. J. Murray, in Watt's "Dictionary of the Economic Products of India," states:—"The leaves form a good fodder and are said to act as a lactogogue (milk-producer) on cows." R. H. Beddome in his "Flora Sylvatica for Southern India" states that "Cattle are very fond of the leaves," and J. F. Rock, in his recently published work "The Leguminous Plants of Hawaii," page 170, states that "The leaves of this species are a valuable fodder for live stock."

Other Uses.—The tree is one that is eminently adapted for street, esplanade, and general ornamental or shade purposes. Seeds germinate readily, and R. H. Beddome states that "Boughs stuck into the ground root readily, and grass and almost everything else grows well under its shade." The seeds are rich in oil, which is used by the natives of India as a lamp oil, also as a cure for skin diseases and rheumatism; and for many of the former, used as an external application, it is said to be very efficacious.

The wood is used in India and Malaya for a variety of purposes, but is said not to be very durable.

Poisonous Properties.—According to Roth (North Queensland Ethnography Bulletin, No. 3), the natives of certain parts of North Queensland used the roots for poisoning fish, the roots being roasted, beaten up on a stone, thrown into the water and left there all night. In experimental work by Harris and Smith (Memoirs of the Queensland Museum, vol. v., p. 13), the action of the root as a fish poison was found "to be rapid and effective, the leaves being only less potent than the roots." Apparently this poisonous property, whatever it is, does not affect the value of the tree as a fodder for live stock.

Botany of the Species.—The tree has received various names, the oldest botanical one apparently being *Cytisus pinnatus L.* (1753), for which reason Merrill (An Interpretation of Rumphius's Herbarium Amboinense, p. 271), has proposed the name *Pongamia pinnata.* It was named *Pongamia glabra* by Ventenat in 1803, and his name has been in such universal use since then that little good would seem to be effected by a change. Bentham (Flora Australiensis, vol. ii., p. 272), recognises a variety from several localities in North Queensland which he terms *var. minor* on account of the leaflets being small and narrow; it is very doubtful, however, how far varieties can be recognised in such a variable and widely distributed tree, and in the Queensland Herbarium we have the leaflets ranging from ½ inch broad (*var. minor*) to 4½ inches broad (exceptionally large).

PLATE 3.—THE PONGAMIA TREE (*Pongamia glabra*).

1. Leaf and flower-bearing shoot. 2. Pods. 3. Seed. 4. Round galls often found on the flowering branches. (All reduced to the same scale).

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigations from the Entomologist, Dr. F. J. Illingworth:—

Though the weather has been rather dry of late, the prospects remain excellent for the next season's crop. Light showers have helped out so that the young cane has not suffered so far, and there is now every prospect for continued rains. There has already been sufficient precipitation at Babinda to start the emergence of the beetles, and at the same time stimulate the growth of the crops. Consequently, all insect life is more in evidence in that humid belt than in the vicinity of our station.

As indicated in my August report, the Tachinid parasites (*Ceromasia sphenophori* Vill.) of the borer beetle were found fully established in the field where they were liberated last year at Moolaba. Just recently, however, investigation has shown that these valuable insects have spread most wonderfully, covering an area of approximately 50 square miles. In fact, they have spread to all of the farms lying south of the mill, extending 7 miles with nearly 6,000 acres of the best cane on virgin soil, much of it on the river flats, which produce exceedingly heavy crops.

BEETLE BORER PARASITES.

Through the cordial co-operation of Mr. A. L. McColl, manager of the Babinda Mill, I was able to make a comprehensive survey of the status of the Beetle Borer (*Rhabdoonemis obscura* Boisd.) in that district, at the end of October. I am also particularly indebted to Mr. George Robinson, the efficient assistant cane inspector, who took me on the rail motor to the most favourable locations for investigation, and gave me other valuable assistance. I was at once struck with the scarcity of borer injury in the whole district—the improvement over conditions prevailing last year was most marked. At the time that I liberated the flies at Rutherford's farm, 16th June, 1919, every stool appeared to be injured, and many of the stalks were totally ruined before they were sent to the mill. Now, however, there is hardly more than an average of 1 per cent. of the canes bored, as far as I was able to determine by an examination of the butts on the trucks. Undoubtedly the flies had a most excellent chance to become established in that location, for the cane was thoroughly infested, and stood for several months after the parasites were liberated. Then, too, there was young cane alongside infested with borers, which stood over until this season. A brief search revealed the parasites well established in this; we then proceeded to the farm of G. M. Reid, where we saw our parasitic flies sitting all over the trucks of green cane, sipping at the juice at the ends of the sticks; they had evidently just emerged that morning after the cane had been loaded. Passing on down the line to the south we came to a rake of trucks with burnt cane from the Bartle Frere Estate (W. Thiel's), and found the parasites also roosting on the sticks, feeding on the exuded juice. This was, indeed, surprising, for this cane was about 2½ miles from the place where the flies had been liberated. I was now anxious to know how widely the parasites had spread, so we continued across the Russell River and right down to the end of the line to Mr. S. H. Warner's farm, where, though the borers were very scarce, we found the parasites, which were evidently holding them well in check, fully 3½ miles from where the flies were first liberated. Returning, we stopped for a few minutes at the camp on the farm belonging to J. Maranoni, on the Queensland National Bank Estate, where I found a single stick showing borer signs. Cutting this open I located three grubs and each contained two maggot parasites—unmistakable evidence of their valuable work. On our way back to Babinda, about 3½ miles from Rutherford's, on the other side, I found the flies on trucks of green cane on a farm recently purchased by Mr. G. Cole from Mr. E. Otes. From the way that we found the newly-emerged flies sitting all over the trucks of cane in the field, and because the parasitised cane is often lost off during transit to the mill, I concluded that the flies would quickly spread to the area immediately surrounding the mill. This we have since been able to demonstrate. Mr. A. P. Dodd, Assistant Entomologist, and I have just concluded the survey, with results that are most gratifying—the parasites being established

everywhere that we looked for them. Hence we now know that they cover the whole area lying to the south of the mill, which furnishes the great bulk of the mill supply, *i.e.*, 6,000 out of the total of 7,000 acres.

Furthermore, it is gratifying to learn that the cane is cutting so much better than anticipated that the mill has recently had to revise its estimate, making an increase of 10,000 tons. Undoubtedly this advance is due largely to the activities of the Tachinid parasites in checking borer injury, hence the increased growth. As I have indicated in a previous report, the monetary value of these flies has been carefully determined in Hawaii, where it was found that they saved approximately a ton of sugar per acre the first year, with a further increase of 1¼ tons when they got fully to work, *i.e.*, £30 to £65 per acre as prices go here at present. Multiply this by the 6,000 acres benefited, remembering that the possibilities of spreading are practically unlimited. The outlook for the future is most encouraging, especially considering Australia's normal sugar shortage, since we find that the flies do so well, even in our wettest regions, where the beetle borer appears to be particularly destructive. And, moreover, true parasites, such as these Tachinids, can never become a pest, for the parasites can only develop in the larvæ of the host; once the host becomes scarce, the parasites are likewise reduced in numbers, until the balance of nature is finally reached, with just a few of the pests which inevitably escape, and a few parasites to search them out—neither greatly in evidence.

Regarding the question of the effect of burning the trash on these flies, let me say that I do not think that they will be seriously hindered by the fires. I have come to this conclusion from observations at Mossman, where, though all the cane is burnt every year before harvesting, the flies continue on duty wherever the beetle borers are in evidence. I still favour burning on all infested land, for it certainly destroys many pests in the fallen trash. Furthermore, infested fields are usually those rich in humus, so the trash is not so much required for fertility.

BEETLES EMERGING AT BABINDA.

Several light showers have started the emergence of beetles in this district. *Lepidiota caudata* Blkb., usually the earliest to come out, began to appear in numbers on 14th October, and fresh specimens continue to come to light (15th November). About 1st November I found a few *Lepidiota froggatti* Macl. and *Lepidiota albohirta* Waterh., both on feeding trees. At the same time various species of *Anoplognathus* began to appear, particularly *A. punctulatus* Oll. and *A. Smaragdinus* Ohaus, which swarmed in hordes over the wattles and other feeding trees. It is interesting to note that these beautiful green beetles remain on the trees during the day, where they continue to feed; and I have observed many mating pairs even at noon when the sun was very hot.

LINEAR BUGS.

For some reason this pest has considerably abated about the Mulgrave region, so I was interested to note that these bugs were present in great numbers in some sections of the Babinda area, particularly in those fields where there was abundant grass along the tramlines and in the headlands. In such fields I found young nymphs in all stages (10th October), especially on the ground at the roots of the grasses, and the leaves of the cane were covered with them on the undersides. In such cases it might be well to kill the grass with a spray of sodium arsenate, where there is no danger of stock getting at it. Treated thus it would be easy to burn within a few days, if it were possible to do so without destroying the cane.

CAMPSOMERIS WASPS.

I have called attention to the value of nectar-bearing plants in the vicinity of grubby areas, so that these wasps might be enticed and assisted in their destruction of the pests. While at Babinda I was interested to note the number of female wasps feeding on the flowers of a wild raspberry which grows abundantly by the roadsides adjoining cane areas there. Possibly the prevalence of these plants attracts so many of the wasps that they hold the grubs in check. At any rate, there has been no extensive injury from these pests in the Babinda area. The depth, too, at which these parasitic wasps go after grubs in the soil is most remarkable. Recently, at Greenhills, while excavating under stools of cane for the study of the grubs, we found two cocoons of the wasp at a depth of 42 inches, in soil so hard that we could barely chip it out with the spade. It is a known habit of this wasp to burrow with the grub, after she has paralysed it, as deeply as possible into the soil, so that her young will not dry out too much, *i.e.*, she tries to get down where the soil is permanently moist.

ARSENIC FOR GRUB CONTROL.

Recent experiments with this poison in the garden for the destruction of the grubs of *Isodon puncticollis* Macl. have proved its merits. In the preparation of hills for cucumbers, &c., as reported last month, I mixed fresh cow dung with the soil. Shortly after the plants began to spread, and before they even flowered, they became yellow and stopped growing, so that they quickly died out altogether. Investigation showed that the soil in these pits was simply alive with grubs of the above species in all stages; the beetles evidently were attracted in the first instance to the cow dung, and as the grubs increased in size they destroyed the young feeding roots of the plants. By dusting the cow dung with dry arsenic, using approximately the same amount that we have been applying to cane drills (80 lb. per acre), I prevented any grubs developing, though the adult beetles were found in this poisoned soil—evidently laying. Following this, I tried dusting the pits where the plants had died, mixing the poison with the soil, and left all the full-grown grubs (40 to 60 in each). Four days later I was unable to find any living grubs in these treated pits, though several living beetles still remained. These results are very encouraging, for evidently arsenic is quick death to these grubs, even when full-grown. And, furthermore, we have already demonstrated that the plants are not in any way injured by the application of this dry form of the poison to the soil. Since the *Isodon* grubs are very similar in habits of feeding to our regular cane grubs, these experiments lend further evidence to this important problem. Furthermore, our extensive experiments at Greenhills, where we have numerous plots to determine the value of poisons for the destruction of soil pests, are progressing favourably. Now that the rains have started the beetles will soon emerge; then, after two or three months we shall know the outcome, upon which our hopes are based.

GRASSHOPPER CONTROL IN NORTH QUEENSLAND.

BY J. F. ILLINGWORTH.

Since grasshoppers are usually so well controlled by natural enemies in Australia, crops seldom suffer here to the extent that they do in less-favoured countries. In fact, these omnivorous feeders are capable of multiplying in such hordes, if not held in check, that they may devour every particle of verdure as they pass along through the country. This was the case in Kansas in 1874, the celebrated grasshopper year, when every crop was wiped out. In such instances it is no wonder that they are rated as the most destructive of insects.

Nevertheless, our parasites here, even the useful egg-parasites, normally so abundant, apparently are negligent at times for some unaccountable reason, and as a result so many of the hoppers hatch that they may become a scourge to our crops. For this reason our demonstration, by which we speedily checked this pest at Meringa recently, will prove of interest.

Early in June there was a primary outbreak which did some damage to sugar-cane; but since nothing was done to check the insects, many eggs were laid, which resulted in hordes of young hoppers appearing in September. The nymphs were so numerous that they covered the ground, and they gradually moved as an army through field after field of cane; their general path led westward, and wherever they camped to feed, the leaves were stripped to the midribs.

At the time that my attention was called to this latter swarm they had travelled about a mile, and men were in the act of trying to drive the full-grown nymphs out of the sugarcane into the dry grass, where they hoped to destroy them by fire. This proved of little avail, however, so I at once set about to destroy them with arsenic, for if they were permitted to reach the winged stage they would naturally fly widely and possibly become a serious menace.

CONTROL MEASURES.

In Kansas, where these pests make periodic appearances, the losses are often tremendous. Hence, experimentation has been carried out there on a large scale. A few years ago they developed a poisoned bait, which has proved most effective and is now generally used. This consists of—

Bran	20 lb.
White arsenic	1 lb.
Molasses	2 qts.
Lemons	3.
Water	3½ gals.

PLATE 4.—(FIG. 1) DESTRUCTION OF SUGAR-CANE BY GRASSHOPPERS.

Photo. taken shortly after they entered the field ; the young hoppers are to be seen on the leaves near the centre of the picture.

PLATE 5.—(FIG. 2) DESTRUCTION OF SUGAR-CANE BY GRASSHOPPERS.

A view showing the condition in which the field was left; the green leaves were eaten right down to the midribs. The leaves showing in the lower part of the picture were too dry for food.

The arsenic should be mixed with the bran dry; the lemons minced in a meat-grinder and added with the molasses and water, stirring so as to dampen the mash thoroughly. The attractiveness of the bait was found to be greatly increased by the oil from the rind of the lemons.

A year ago, grasshoppers again appeared in such numbers in Western Kansas that they threatened to wipe out all growing crops. Before control measures could be got under way they had destroyed vast quantities of nearly-ripe grain; in one county it was estimated that more than three million dollars' worth of wheat was destroyed. Rapid progress was made, however, in organising the thirty-nine counties affected; the total amount of bran mash distributed was 4,565 tons; this required 83 tons of white arsenic, 498,000 lemons, and 83,000 gallons of syrup. Thus, by an expenditure of a few thousand dollars, many millions of dollars' worth of crops were saved.

In using this mixture at Meringa it was prepared as above, and was sown broadcast very sparingly, so as to make it cover as much ground as possible. Then, too, by scattering the mash in the smallest possible particles it is not a menace to birds or poultry, for they could hardly pick up enough of the poison to injure them. Moreover, I found it best to scatter the bait in strips, about three or four rows apart, to conserve material. In the second lot that I made up I used double the quantity of lemons, since the bits of rind appeared to be much sought after by the young hoppers, and this fruit costs nothing here. The addition certainly appeared to increase its attractiveness.

About four hours after treatment I found many of the hoppers sick and crawling under the cane stools, where they appeared too weak to get away. Next day the dead hoppers were everywhere, especially under the stools and any trash that happened to be about. It was practically a clean sweep of both young and adults. I was surprised to find that the winged insects were so attracted to the bait, especially since there was plenty of standing cane with an abundance of green feed everywhere.

THE BEAN STEM WEEVIL.

A MINOR PEST OF BEANS.

The damage done to the french bean in our vegetable gardens demands some remedy which, as yet, has not been discovered in Queensland, so far as we know, unless we except the destruction of the plants by fire. Following is a very exhaustive paper on the subject, by R. W. Jack, F.E.S., Agricultural Entomologist, Department of Agriculture, Rhodesia, S.A.:—

"The insect to which the above title has been given is frequently responsible for destruction of small plantings of french beans in gardens, and is also an enemy of the cowpea or kaffir bean. It was identified as a pest from a garden near Old Umtali in 1913, and this appears to be the first record of its breeding habits, although the beetle itself had previously been described under the name of *Alcides leucogrammus*, Erich. Since that year it has appeared annually on the experimental plots at the Agricultural Laboratories, Salisbury, and has been observed on farms in different parts of Mashonaland.

"DESCRIPTION.

"The adult beetle, a female, is figured at six times its natural size at Fig. 4 on Plate 6. The actual length of the specimen including the 'beak' is about 10 m.m., or roughly thirteen thirty-seconds of an inch. The 'beak,' it may be mentioned, is in reality a prolongation of the head, and carries a set of jaws at the end, for, like all beetles, the Bean Stem Weevil is a biting insect. This prolongation of the head is characteristic of the family (Curculionidæ) to which the weevil belongs, and is the origin of the name 'Snout Beetles' frequently applied to members of the family. The 'beak' or snout varies greatly in shape and size with different genera, being sometimes short and as broad as it is long, and at others very long and slender, many varieties of intermediate forms also occurring. As the Bean Stem Weevil usually carries its head with the 'beak' pointing downwards in nature, it is more convenient to measure the insect in this position and leave out the length of the snout. The females are on the average larger than the males, the smallest male in the office collection measuring 6.5 m.m. and the largest female 8 m.m. (in both cases exclusive of the 'beak'). The coloration is black and cream in fresh specimens, but the latter colour darkens somewhat with age.

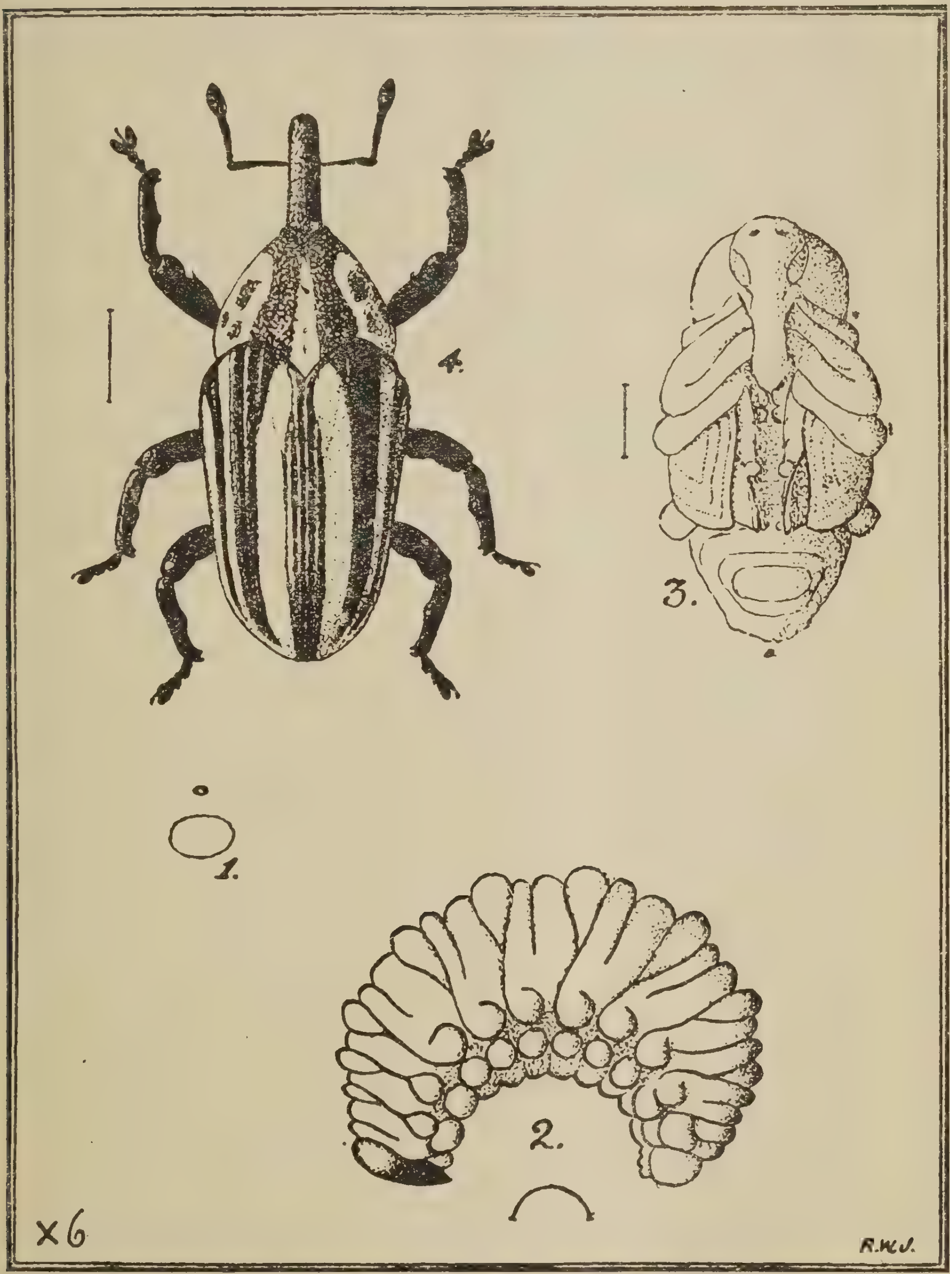

PLATE 6.—THE BEAN STEM WEEVIL.

"The whitish *larva or grub*, shown at Fig. 2 on Plate 6, is of the usual legless type of members of this family, the head being of a more or less brown ochre colour. There is little variation in the larvæ of allied species of this family, so further description is unnecessary. The *pupa* (chrysalis stage) is figured at Fig. 3 on the same plate and the egg at Fig. 1. All these figures are at the same magnification, namely, multiplied by six diameters, that is to say, six times as long and as broad as their actual size. The white shiny egg is thus a fraction over a millimetre (one twenty-fifth of an inch) in length.

"HABITS.

"The beetles feed mainly upon the stems and branches of the plants, in which they cut longitudinal grooves from which much frayed fibre projects. The eggs are laid in cavities at the base of the stems, the cavities being first prepared by means of the mouth-parts. Eggs timed in confinement hatched in about six days. The larva feeds on the tissues at the base of the stem, several commonly being found in one plant, and considerable swelling, often accompanied by formation of callus, results (see Plate 7). Where only one larva is present it is often entirely enclosed in the swollen stem and callus may not form to any great extent, but when, as is often the case, several are present, some are only partially buried in the stem, and much callus may be present. When full-grown the larva changes to the pupa stage within a tough oval cocoon, attached to or enclosed in the plant stem. The substance of the cocoon is mixed with fibres from the plant, and is more or less earth coloured. The adult beetle seems at times to remain in the cocoon for an indefinite period before making its way out to the light of day, but this is more noticeable in the later broods towards the end of the breeding season than when breeding is proceeding at its maximum rate. In the height of the summer the period of development from the deposition of the egg to the emergency of the adult may be as short as 50 days, but many specimens develop slowly and take much longer. In plants exposed for one week to the beetles for egg deposition half-grown larvæ were found at the time the first adults emerged.

"Breeding appears to be restricted to a short period of the year. The insect passes the winter as an adult, remaining buried in the ground during the colder months, but emerging to feed, if food is available, as the weather grows warmer. Egg laying has not been ascertained to take place earlier than late November, but except where the plants are watered or the soil is naturally moist, growing beans are not available under cultivation much earlier than this. Adult beetles have been seen in small numbers feeding on kaffir beans in a moist situation in mid-November, but no eggs or grubs could be found on the stems of the plants. This rather suggests that breeding even where conditions are favourable does not commence quite so early. Eggs laid in late November should produce adults from the middle of January onwards, and no beetles have been bred from infested plants earlier than this, although they have been found in the field in early January. The latter are judged to be specimens that have over-wintered, as the plot on which they were found was only planted on 26th November, and could not have been ready for egg laying until December. No earlier beans were in the vicinity. Over-wintering beetles have survived in the laboratory until late January, and then apparently escaped. Beetles bred out during January and February commence to lay after a few days, and this presumably constitutes the second brood, producing adults again during March and April. Beetles emerging in March and April have not laid eggs in the laboratory. It appears, therefore, that not more than two generations mature during the year, and that, owing to the longevity of the beetles, a considerable proportion of eggs laid by over-wintering beetles may produce beetles which live over the next dry season before commencing to lay, and under such circumstances, of course, only one generation occurs. Beetles were collected in small numbers, for instance, on cowpeas on 1st January, and the patch was apparently free from adults until late February and March, when considerable numbers appeared and were collected. These failed to lay in confinement, but lived on through the winter, whilst the January specimens laid freely under similar conditions during that month, adults of the next generation also appearing in late February and throughout March and early April.

"FOOD PLANTS AND DAMAGE.

"The Bean Stem Weevil, like the Bean Stem Maggot (*Agromyza sp.*) has only been found attacking beans of the genera Phaseolus and Vigna, that is to say, french beans and cowpeas. Velvet beans and other beans of different genera appear to be immune.

"A plant may apparently carry one grub without actually dying, but its growth and production are seriously interfered with. Many plants are killed outright and others become yellow and drop their leaves and die more slowly. Damage is sometimes overwhelming where a few rows are grown in kitchen gardens, but the weevil's capacity for increase does not seem sufficient to make it a serious field pest.

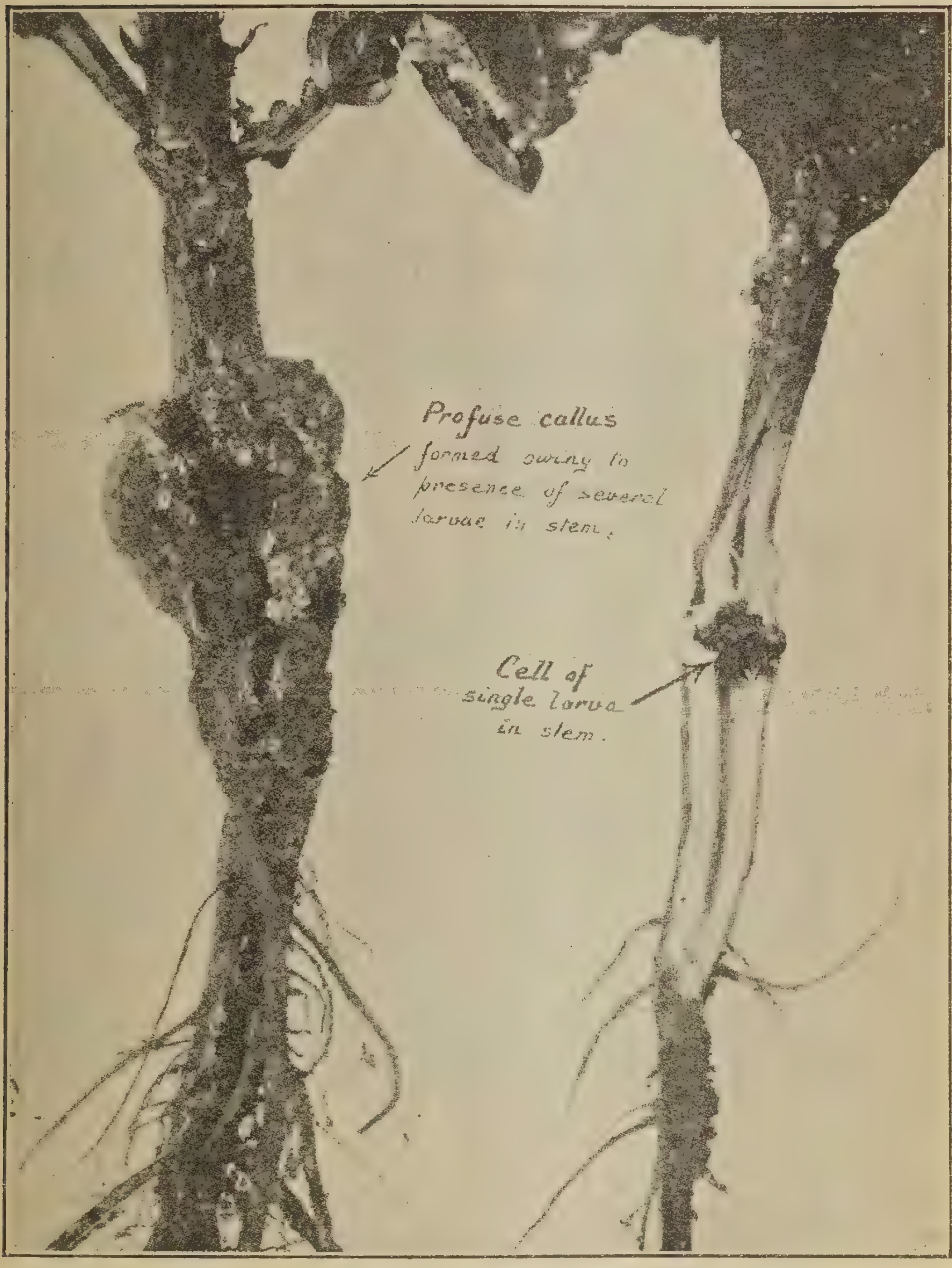

PLATE 7.—BEAN STEM WEEVIL.

"ENEMIES.

"No parasites have been bred from the grubs, but observations in the field have indicated considerable destruction by enemies, which eat into cocoons and devour the pupæ or resting adults, and probably also the larvæ. The driver ant *Dorylus helvolus* appears to be the chief enemy in this respect, as this species has been found on more than one occasion swarming in the empty cocoons and cavities of the stem weevil at the time the neighbouring plants contained larvæ. The wing covers and harder parts of the beetles have also frequently been found in cocoons, in which a small hole about one-twelfth of an inch in diameter had been eaten. This may have been the work of Dorylus or not, but no other enemy has actually been observed.

"CONTROL MEASURES.

"The insect is merely a minor pest of the kitchen garden, and no control measure is needed other than the removal and destruction by fire of infested plants, care being taken to remove the whole plant for this purpose. As a matter of practice all beans subject to attack should be pulled up and burned as soon as their period of usefulness is over, especially during the earlier part of the season.

"*Acknowledgment.*—Contributions to the life history of this insect, embodied in the foregoing account, were made by Mr. R. L. Thompson, late of this department.

"EXPLANATION OF PLATES.

Plate 6, Fig. 1. Egg of Bean Stem Weevil enlarged six times. The actual size of the egg is shown immediately above the enlarged figure.

Fig. 2 Larva approximately full-grown. Actual length indicated by hair line beneath.

Fig. 3. Pupa. Actual length indicated by hair line to left.

Fig. 4. Beetle or adult. Female. Actual length indicated by hair line to left.

Plate 7. Two cowpea stems injured by Bean Stem Weevil. The one on the left was attacked by several larvæ, and much callus has formed. The one on the right was attacked by one larva only, and its feeding chamber can be seen in the sectioned stem. From the outside the stem appears only slightly enlarged in the region of attack."

GLAZING A CEMENT BARREL.

The reply given in last month's Journal to our correspondent was intended for a barrel of wood. The same method, however, if applied several times, hot, should be successful with a barrel made of cement and sand, if applied several times hot, as it forms insoluble silicates which are practically indestructible. Twenty-four hours should be allowed between the application of each coat.

Another process may be tried, which is intended to make the inside of the barrel waterproof, and, at the same time, give it a slight glaze:—Mix ¾ lb. of castile soap with one gallon of water, and paint the inside of the barrel with the liquid while quite hot. Allow to stand for twenty-four hours. Then apply a coat of ½ lb. of alum dissolved in 4 gallons of water. After twenty-four hours, repeat the coats, until a chemical glaze is formed, which is said to be watertight for years. If it is found that salt affects the glaze, repeat the operation as often as necessary.

REVIEWS AND NOTICES OF BOOKS.

"An Authography of the Eucalyptus," by Russell Grimwade, B.Sc., Sydney, Angus and Robertson, 1920, is a most interesting description of many of the species of Eucalypti met with in Australia. There are about 250 described species of the genus Eucalyptus, of which the author has described and beautifully illustrated the leaves, flowers, and fruits. It would have added to the interest of the book if photographs of the bark characters had been included, as the bark, especially in Eucalypts, varies considerably. As an artistic work the book will doubtless be favourably received by those interested in forestry, and we here express our thanks to the author for his donation to our library.

General Notes.

PREVENTING THE INTRODUCTION OF COTTON PESTS INTO CALIFORNIA FROM MEXICO.

The "Monthly Bulletin of the Department of Agriculture, State of California," gives the following account of how the introduction of the Mexican pink bollworm and the Mexican cotton bollweevil by military manœuvres was prevented, by inducing the Mexican troops to recognise plant quarantine:—

"Early during the past summer rumours became current that a change of government was imminent in the Northern District of Lower California. Later on came the announcement on the part of the Cantu Government that it would resist, by force of arms, if necessary, any attempt of the *de facto* Government of Mexico City to instal a governor of its selection in the Northern District, and reports were received that an armed force of some three thousand men had left Mexico City to

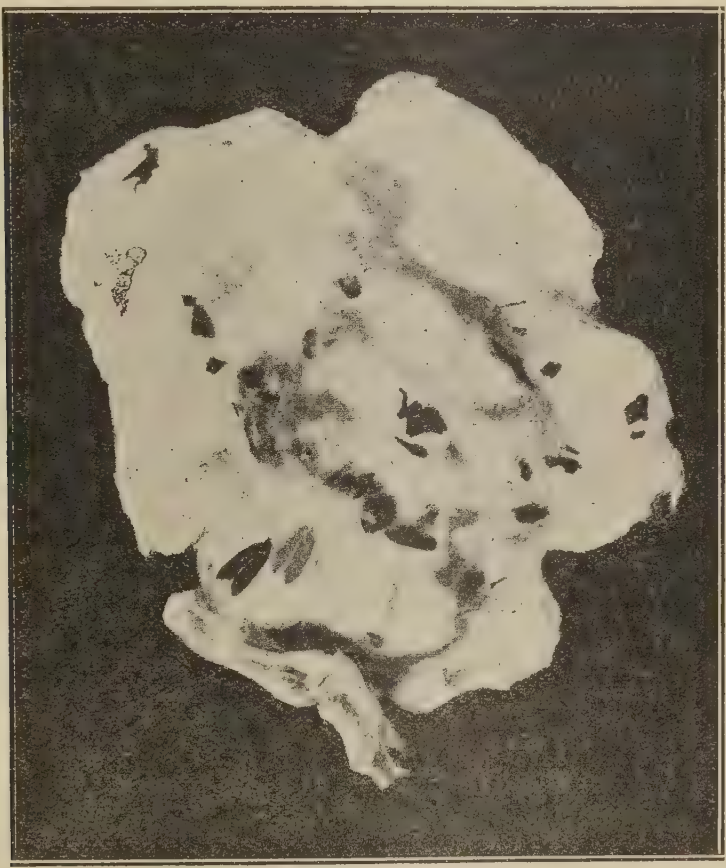

PLATE 8.—In the lower left-hand corner, note the moth that produces the "Pink Bollworm of Cotton!"

invade the district and compel the surrender of the Cantu Government. Eventually the political differences between Governor Cantu and the Central Mexican Government were peacefully adjusted and the governor resigned in favour of the new appointee, Luis M. Salazar. Though the danger of armed conflict had passed, it became known that the *de facto* troops would nevertheless proceed to occupy the Northern District of Lower California. Considerable uneasiness was felt on the part of the cotton interests lest this army movement might be the means of introducing the pink bollworm or the Mexican cotton bollweevil into the cotton fields of Imperial valley, as it was known that the troops were coming from areas infested with either one or the other or sometimes both of these cotton pests. How well founded these fears were may be understood when it is explained that Mexican troops are usually accompanied by their wives and children and carry with them all sorts of luggage, including pillows and mattresses, which they frequently stuff with seed cotton, picked by the wayside when 'on the march.'

"As soon as it was learned that the troops, who were under the command of General Abelardo Rodriguez, had arrived in Sonora and were proceeding northward toward San Luis, from which point they would begin the last leg of their march to Lower California, the writer, through the courtesy of the Mexican Consuls at Calexico, California, and Yuma, Arizona, got in communication with General Rodriguez and arranged to meet him at San Luis, Sonora, for the purpose of an interview. In this interview, which took place at San Luis, Sonora, on Friday, 27th August, it was explained to the general that the port of Calexico, California, had been maintained open for the importation of cotton grown in Imperial Valley, Lower California, Mexico, largely because of the geographic isolation of the Northern District of Lower California and the consequent meagre traffic between the Northern District and the main portion of Mexico, which eliminated to a great extent the danger of introducing such cotton pests as the bollweevil and the pink bollworm; that there was grave danger of carrying these cotton pests into Lower California if his army proceeded without his taking the precaution to leave behind all materials which might carry the larva, adults, or eggs of these insects. The general replied, in substance, that the troops were to be newly clothed with new blue denim overalls, given new blankets, underclothing, and, in fact, newly clothed throughout with clothing which had been ordered from Los Angeles, California; that inasmuch as the old uniforms and clothing, then being worn by the soldiers, were badly worn, and practically useless for further service, from a military standpoint, it would occasion no great loss if the entire outfit to be discarded were burned there in the desert where the troops were then camped. This the general promised to have done. It was learned further, from the visit to the camp, that, contrary to custom, these troops had not brought with them their wives and families, which, of course, simplified the problem considerably.

"The troops arrived in Mexicali, capital of the Northern District of Lower California, opposite Calexico, California, on the morning of the first day of September, clad in new blue denim overalls, and otherwise newly clothed, carrying only their guns and rations, and a cotton blanket apiece. Later on, General Rodriguez informed the writer that, as an extra precaution, he had ordered to Ensenada and Tijuana, on the Pacific Coast, the only regiment that had recently seen service in the cotton-growing districts of Mexico. Thus passed, as it is confidently believed, the danger of the introduction of cotton pests into Imperial Valley through the invasion of the troops of the *de facto* Government of Mexico City. The present Government of the district states that the troops which recently arrived will be assigned to permanent duty in the Northern District, and so remove the need of further troop movements into the Imperial Valley cotton-growing area and the consequent endangering of the cotton industry."

CURING HIDES.

Frequently we are asked for a method of curing hides for home use. The following, which is taken from the Fijian "Agricultural Gazette," should prove useful; it was prepared by the Government Veterinary Officer:—

1. Immediately after skinning, the hide should be placed stretched out hair-side downwards under cover or protection from sun and rain.

2. Ten pounds or more of salt must be used for each hide, well rubbed in and well sprinkled over it.

3. In addition to the above, the hide should be well sprinkled with either (*a*) ½ lb. of boracic acid or (*b*) ½ per cent. solution of arsenite of soda.

4. The hide should be left for fourteen days, when it may be rolled up for export.

The boracic acid has the advantage of keeping the hide soft, thus facilitating the operating of rolling it into a bundle. Arsenite of soda may be purchased in the form of a commercial arsenical cattle dip. It may also be made by boiling together 1 lb. of white arsenic and 2 lb. of washing soda in 1 gallon of water until all is dissolved. With ordinary commercial white arsenic this solution so obtained may be taken roughly as 10 per cent. strength. For use it should be diluted 1 in 20.—"Farmers' Gazette."

CARROTS FORKING.

The land on which it is intended to raise a crop of carrots should be a rich, sandy soil which has been heavily manured for a previous crop. Soil treated with rank, new manure will not grow good carrots, as they invariably grow coarse and flavourless if the manure is too new. Therefore, if the soil requires enriching have the manure applied some time previous to sowing the seed, and in order to prevent "forking" it ought also to be ploughed or dug deeply, thus enabling the roots to grow long and straight. If the ground is hard underneath growth may take place from the sides of the roots instead of continuing straight downwards, and "forking" is inevitable. The best time to sow carrots is in March or April, and with a little care they may be grown all the year round. The same treatment is applicable to parsnips. Before sowing the seed of either of these vegetables, the soil should be made as fine as possible, and the drills should not be more than 1 inch deep.

FOR PUBLIC INFORMATION.

THE COMMONWEALTH BANK OF AUSTRALIA AND THE QUEENSLAND GOVERNMENT SAVINGS BANK.

Attention is drawn to the fact that the Agreement between the Commonwealth Bank of Australia and the Government of the State of Queensland, providing for the transfer of the said Bank of the Queensland Government Savings Bank business, has been ratified by Parliament, and from 6th December, 1920, the combined Savings Bank business will be carried on by the Commonwealth Bank of Australia.

It is the intention of the Commonwealth Bank to conduct at an early date general banking in addition to Savings Bank business at all the late branches of the Queensland Government Savings Bank, and also to establish Savings Bank centres at other points to facilitate the handling of the business.

OF INTEREST TO RUBBER PLANTERS.

WHAT EVERY PLANTER OUGHT TO KNOW.

By FRED KNOCKER, F.Z.S.

(Author of *Hevea Braziliensis* in British Malaya).

From "The Planters' Chronicle," Madras.

A SIMPLE LESSON ON THE PHYSIOLOGY OF HEVEA BRAZILIENSIS.

I am not going to preach a sermon, but I should like to take for a text the 2nd and 3rd paragraphs of the 51st page of the first number of "The Planter": "Bark Renewal"—"The Origin of Latex." Assuming you have read and marked the substance of this text, we will now proceed to learn it, subsequently leaving it to the reader's discretion to inwardly digest it. It will be a long, circuitous route, and for the planter bereft entirely of any knowledge of plant physiology it may become tedious. Howbeit, the author promises faithfully, on the one part, not to inflict upon his readers anything beyond the simplest of scientific nomenclature, nor puzzle them with abstruse phraseology, so that the veriest tyro may safely venture on the journey. If, on the other part, the reader follows the author closely, even the wisest of you may lay down the paper eventually with a feeling of having been mildly interested, whilst the untutored may become imbued with a sense of self-satisfaction at having mastered a very simple elementary lesson in physiological botany.

The life of the rubber planter is thwart with averages; so I may be forgiven if I start right off by saying that the average rubber planter's knowledge of the anatomy of the tree he has to deal with is confined to wood, bark, and cambium. Over and beyond these he has some vague idea of a current of water passing up and down the tree and called the sap. When the bark is cut by the tapping coolie the average planter is ocularly convinced that a white, milky fluid is contained somewhere in the bark, and that fluid he has been taught to call latex. I have occasionally met planters who have actually wondered how this latex gets there, and what it is for; but the planter who expresses any innate inquisitiveness as to how the bark, once destroyed, gets renewed belongs to a class above the average and might be honestly termed a

rara avis! If you ask our friend the average planter how it comes about he dismisses the subject airily with: ''Oh! the cambium does all that sort of thing''—just as we might reply to the question, where the water in the bath jar comes from every day—''Oh! the *tukang ayer* sees to that!''

However, here we have at least a workable basis on which to start our lesson: the wood, the bark, the cambium, the sap, and the latex. To get a fair grip of the subject our preconceived idea of the wood forming one substance in the centre of the tree has to be amplified; whilst what we know of the bark has to be completely revolutionised. These two points and the mystery of the cambium cleared up, then the true meaning of the simple words sap and latex will follow automatically.

The real centre of any tree is not the wood at all: it is the *pith* or *medulla.* To the rubber planter, however, it is of no consequence. Indeed, it is of very little consequence to the tree itself—so little consequence, in fact, that in some trees it is entirely missing. In other words, it takes no part at all in the life system of the tree. Now the wood itself does; and in order to do so it is divided by nature into two parts. There is the old wood, naturally the inner portion and increasing in hardness towards the centre ring, the degree of hardness varying in different species of trees, as, indeed, is well known. Then there is the young, outside wood, soft and moist. This is called the *sap-wood* or *alburnum,* as distinct from the *heart-wood* or *duramen* of the old wood. The two together are known as the *xylem.* Of these names the reader can please himself which he uses in future, but for the purposes of this article I shall prefer the more simple, homely-sounding ones. So, the heart-wood's function in the life of the tree is to merely support the stem; but that of the sap-wood is far more important, containing as it does vessels acting as air-carriers and fibres through which the sap passes up the tree—hence the title sap-wood.

That is, roughly, the physiological significance of the word ''wood'' or ''xylem.'' But before carrying on with our other household words it would be as well to break off here and go right into this business of the sap, a full understanding of which is positively necessary for the exposition of our text.

It has been pointed out that the sap passed upwards through the fibres of the sap-wood—a simple statement on a par with the one anent the cambium and bark renewal! Nevertheless, there must be some force, or forces, at work to induce any liquid to flow upwards in a vertical direction. This opens up a wide field of controversy and well known botanical facts. The former need not concern the practical planter, excepting, if so he chooses, as a hobby. Of the latter the one outstanding feature is the natural phenomenon known as *transpiration,* and that does concern every practical rubber planter very considerably. Speaking broadly, a knowledge of other causes of sap movement are immaterial to the rubber planter from a practical, or utility, standpoint. It engenders a far more intimate knowledge of cellular formation and plant histology than is compatible to a magazine article. Yet a generalised understanding of this process of transpiration cannot be otherwise than helpful to the young rubber planter; and, were it not for the lamentable fact that a generation of rubber planters has passed away in abject ignorance of the knowledge, I should say it was indispensable.

To gain a clear impression of plant transpiration and all its import we must transfer our attention, for the time being, from the stem of the tree to its leaves. I suppose we are all alive to the tremendous importance of a profuse and richly hued foliage to *Hevea braziliensis.* Upon it depends all that goes to the making of the rubber planter's fortune. In spite of which, how many of us can answer that little question, ''Why?'' It is a complicated subject, but withal capable of being treated broadly so that we may yet be able to give an intelligent reply to the interrogation in the short space of this lesson.

[TO BE CONTINUED.]

Answers to Correspondents.

FLOWER GARDENING.

''AMATEUR FLORIST,'' Redcliffe.—

The publication on this subject issued for some time by the Department of Agriculture and Stock is now out of print, and the work cannot consequently be supplied to you.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER, 1920.

Article.		DECEMBER. Prices.
Bacon	lb.	1s. 5d.
Barley	bush.	5s. 5d.
Bran	ton	£9 5s.
Broom Millet	"	£30 to £35
Broom Millet (Sydney)	"	£24 to £45
Butter (First Grade)	cwt.	238s.
Chaff, Lucerne	ton	£5 10s. to £8 5s.
Chaff, Mixed	"	£6 to £6 10s.
Chaff, Oaten (Imported)	"	£7 5s. to £9
Chaff, Oaten (Local)	"	£7 6s. to £7 10s.
Chaff, Wheaten	"	£7 16s.
Chaff, Panicum	"	...
Cheese	lb.	1s. 2d.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 11d.
Hay, Lucerne	ton	£5 10s to £5 15s.
Hay, Oaten	"	...
Honey	lb.	6d. to 7d.
Maize	bush.	4s. 4d. to 5s. 8d.
Oats	"	2s. 6d.
Onions	ton	£7 to £8 10s.
Peanuts	lb.	7d. to 9d.
Pollard	ton	£9 15s.
Potatoes (English)	"	£4 to £7
Potatoes (Sweet)	cwt.	2s. to 2s. 6d.
Pumpkins (Cattle)	ton	£2 to £5
Eggs	doz.	1s. 4d. to 1s. 6d.
Fowls	per pair	7s. to 10s.
Ducks, English	"	5s. to 6s.
Ducks, Muscovy	"	10s. to 11s.
Geese	"	10s. to 11s.
Turkeys (Hens)	"	10s. to 13s
Turkeys (Gobblers)	"	28s. to 36s.
Wheat (Chick)	bush.	7s. 7d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	12s. to 18s.
Beans (French), per sugar bag	2s. to 8s. 6d.
Beetroot, per dozen bundles	6d. to 1s.
Cabbages, per dozen	1s. to 6s. 6d.
Carrots, per dozen bunches	1s. to 2s.
Cucumbers, per dozen	3d. to 6d.
Lettuce, per dozen	1s.
Marrows, per dozen	1s. to 3s.
Peas, per sugar bag	3s. to 9s.
Potatoes (Sweet), per cwt.	2s. to 2s. 6d.
Pumpkins (table), per dozen	2s. 6d. to 5s.
Rhubarb, per bundle	9d. to 1s. 3d.
Tomatoes (prime), per quarter case	7s. to 9s.
Tomatoes (inferior), per quarter case	1s. to 2s.
Turnips (Swede), per cwt.	1s. 3d. to 1s. 6d.

SOUTHERN FRUIT MARKETS.

Article.	DECEMBER. Prices.
Bananas (Tweed River), per double case	20s. to 23s.
Bananas (Queensland), per double case	20s. to 24s.
Bananas (Fiji), per double case	...
Cape Gooseberries, per case	6s. to 12s.
Lemons, per bushel case	12s. to 14s.
Mandarins, per case	4s. to 6s.
Oranges (common), per bushel case	10s. to 12s.
Oranges (Navel), per bushel case	16s. to 18s.
Passion Fruit, per half bushel case	3s. to 12s.
Pineapples (Queensland), per double case	20s. to 25s.
Pineapples (Ripley), per double case	10s. to 14s.
Pineapples (common), per double case	10s. to 14s.
Tomatoes (Queensland), per quarter case	12s. to 20s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel case	18s. to 19s.
Apples, Cooking, per bushel case	10s. 6d. to 15s. 6d.
Apricots, per half bushel case	4s. to 9s.
Bananas (Cavendish), per dozen	2d. to 7d.
Bananas (Sugar), per dozen	1d. to 4d.
*Bananas (Lady's Finger), first quality, per dozen	1s. 5½d.
Bananas (Lady's Finger), second quality, per dozen	8¾d.
Bananas (Lady's Finger), third quality, per dozen	4¼d.
Cherries, per tray	6s. to 10s.
Citrons, per cwt.	16s.
Cocoanuts, per sack	£1 5s.
Cape Gooseberries, per quarter bushel case	2s. to 5s.
Lemons (Lisbon), per quarter case	4s. 6d. to 6s. 6d.
Mandarins, per case	3s. 6d. to 6s.
Mangoes (Northern), per bushel case	6s. 6d. to 10s. 6d.
Oranges (Navel), per case	5s. to 9s.
Oranges (other), per case	1s. 6d. to 2s. 6d.
Papaw Apples, per tray	2s. to 4s.
Passion Fruit, per quarter case	4s. 6d. to 7s. 6d.
Peaches, per quarter case	1s. 6d. to 4s.
Pineapples (smooth), per case	7s. 6d. to 10s.
Pineapples (rough), per case	9s. to 10s.
Strawberries, per dozen boxes	10s. to 20s.
Plums, per case	3s. 6d. to 6s.
Rockmelons per dozen	1s. to 6s. 6d.
Tomatoes, per quarter case	2s. to 3s.
Water-melons per dozen	3s. to 17s. 6d.

* On 2nd December a record price was obtained for Lady's Finger Bananas.

TOP PRICES, ENOGGERA YARDS, NOVEMBER, 1920.

Animal.	NOVEMBER. Prices.
Bullocks	£18 15s. to £21
Cows	£16 to £19 12s. 6d.
Merino Wethers	34s.
Crossbred Wethers	35s. 9d.
Merino Ewes	30s.
Crossbred Ewes	32s. 3d.
Lambs	33s.
Pigs (Porkers)	71s.

Farm and Garden Notes for February.

FIELD.—The land intended for potatoes should now be ready for planting. Plant sound small potatoes, well shot, without cutting them. If large potatoes are cut into setts, there is a risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, kaffir corn, imphee, sorghum, and vetches may be sown; but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop, sow swede turnips and mangel wurtzels. Pick cotton as the bolls burst. Do not pick until the dew has dried off the bolls. Expose the picked cotton for a couple of hours to sun heat.

KITCHEN GARDEN.—Make preparations for good crops of vegetables for the early winter by ploughing or digging all unoccupied land, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, if prepared as follows:—

Spread a layer of black soil on the ground. Dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes, so that the compound shall contain—Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel. Mix thoroughly, and a little before planting moisten the heap with water, or, better still, with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbages and cauliflowers ready for transplanting. Do this during the month. In the pamphlet on ''Market Gardening'' issued by the Department, it is recommended to sow the seed from the middle of January to the middle of March, arranging the time, however, to suit early and late districts. For winter crops, the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, are the most profitable. The Savoy cabbage does well here. The best cauliflowers to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand. If the aphis appears, spray with tobacco solution.

Sow french beans, butter beans, beet, carrot, turnip, radish, cabbage, cauliflower, cress, peas. Should the weather prove dry after the January rains, give the plants a good soaking with water. Gather all fruit of cucumbers, melons, french and other beans, and tomatoes as they ripen, to ensure the continued production of the vines and plants.

FLOWER GARDEN.—Thin out and tie up dahlias. Keep the weeds down, and never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months, of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, aster, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemum, verbenas, petunias, pentstamons, &c. Dianthus, sown now and planted out in March, will bloom during the whole year, if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep, as on the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should be covered with fine soil to a depth equal to their own size; for instance, a pea is about one-eighth of an inch in diameter, therefore, cover it with one-eighth of an inch of soil.

Orchard Notes for February.

In order that the series of monthly notes that have appeared for some years past in the ''Agricultural Journal'' might be rendered of more value to our fruit-growers, advantage was taken of the commencement of the new year to revise them and bring them up to date. At the same time, the notes have been somewhat altered, as, instead of making them of a general nature, applicable to the whole of the State, they are, to a certain extent, localised, as, although the general principles of cultivation, manuring, pruning, treatment of fruit pests, as well as of the handling and marketing of the fruit, are applicable to the State as a whole, there are many matters that are of interest to individual parts of the State rather than to the whole State; and, further, notes that are applicable to the Southern part of the State for one month are not always applicable to the North for the same month.

In order to carry out this idea the State has been divided as follows:—

1. The Southern Coast Districts, south of the Tropic of Capricorn;
2. The Tropical Coast Districts;
3. The Southern and Central Tablelands.

This plan has met with such general approval during the past year that the notes will henceforth be published in accordance therewith.

THE SOUTHERN COAST DISTRICTS.

The earlier summer fruits, including grapes, will be pretty well over, but pineapples, mangoes, and bananas are in full fruit. The bulk of the main summer crop of pines ripens during the month, and growers are in consequence kept very busy sending them to both our local markets and canneries, and to the Southern States. The planting of all kinds of tropical fruits can be continued where necessary, though earlier planting of both pines and bananas is to be recommended. Still, if the land is thoroughly prepared—viz., well and deeply-worked—they can be planted with safety, and will become well established before winter. The month is usually a wet one, and both tree and weed growth is excessive. If unable to get on the land with horses to keep down weed growth, use the scythe freely in the orchard before weeds seed, as by doing so you will form a good mulch that will tend to prevent the soil washing, and that when ploughed in later on will add a considerable quantity of organic matter to the soil, thus tending to improve its mechanical condition, its power of absorbing and retaining moisture, as well as to increase its nitrogen contents.

This is the best month of the year in which to bud mangoes in the Brisbane district. The bark of the stock to be budded must run very freely, and the scion, when placed in position, must be tied very firmly. The bark of the scion should be slightly thicker than the bark of the stock, so that the material used to tie it keeps it firmly in its place. As soon as the bud is tied, ringbark the stock just above the bud, so as to force the sap of the stock into scion, so that a union will take place quickly.

Where cyaniding of citrus and other trees has not been concluded it may be continued during the month, as fruit treated now will probably keep clean and free from scale insects till gathered. If the trees have been treated with Bordeaux mixture, do not cyanide, as cyaniding should always be done previous to spraying with Bordeaux mixture.

If Maori is showing, spray with the sulphide of soda wash. Look out for Black Brand and also for the Yellow Peach Moth towards the end of the month in the earlier districts. Spraying with Bordeaux mixture is advisable in the case of both of these pests.

Get land ready for strawberry planting, so as to be ready to set out runners next month. Some growers set out plants as early as the end of February, but March is to be preferred. Citrus and deciduous trees can still be budded during the month. Young trees in nursery should be kept clean and attended to; ties should be cut where necessary, and the young trees trained to a straight single stem.

THE TROPICAL COAST DISTRICTS.

As the month is usually a very wet one in this part of the State, very little work can be done in the orchard other than keeping down excessive weed growth by means of a scythe. When citrus trees are making excessive growth and throwing out large numbers of water-shoots, the latter should be cut away, otherwise they are apt to rob the rest of the tree, and thus injure it considerably. Many of the citrus trees will come into a second blossoming during the month, and this will produce a crop of fruit ripening towards the end of winter and during the following spring. The main crop, where same has set in spring, will be ripening towards the end of the month, but as a rule insect life of all kinds is so prevalent at this time of year that the bulk of the fruit is destroyed. Where there is sound fruit, however, it will pay to look after. If the weather is wet it should be artificially dried before packing; but if there are periods of sunshine, then the fruit can be cut and laid out on boards or slabs in the sun, so that the extra moisture of the skin can be dried out. Care will have to be taken not to sun-scald the fruit, or to dry it too much; all that is required is to evaporate the surplus moisture from the skin, so that the fruit will not speck when packed.

Tropical fruits of all sorts can be planted during the month. Budding of mangoes and other fruits can be continued. Bananas must be kept netted, as fly is always bad at this time of year.

THE SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of apples, pears, plums, peaches, and nectarines will occupy the attention of the Stanthorpe growers. The grape harvest will also extend right through the month. Every care should be taken to see that the fruit fly and codling moth are not allowed to spread, although the best work in fighting these pests has to be done during the months of December and January, as on the action then taken, if carried out systematically, the freedom of the later fruits from infestation mainly depends.

Handle the fruit carefully, and see that no fly or codling moth infested fruit leaves the district. The grapes, ripening as they do when this fruit is over in the earlier parts of the State, should be sent not only to Brisbane, but to all other parts of the State. For long shipment nothing can beat crates holding 6-lb baskets. The fruit should be gathered some hours before packing, and be placed in the sun, so as to become thoroughly dry, and to allow the stems to become wilted, as this causes the fruit to hang on the bunch much better, and consequently to reach its destination in better order.

If parrots and flying foxes are troublesome, organised shooting parties or poisoning with strychnine are the best means of dealing with those pests.

The crop of grapes will be about over in the Roma and other inland districts. Citrus trees, when infested by Red Scale, should be cyanided. The orchard should be kept well cultivated after every rain, and when there is no rain, but water is available for irrigation, if the soil requires it, the trees should get a good soaking, which, if followed by thorough cultivation, will carry the trees on till the fruit is ripe.

GRAFTING THE PAPAW.

The young seedlings may be grafted after being planted out in their permanent positions. The trees from which scions are taken should be such as produce the largest fruits of good quality and the heaviest crops.

TO REMOVE WARTS.

A correspondent of ''Hoard's Dairyman'' gives the following method of removing warts from cows' teats, which he states he has used for many years with complete success:—''Just apply oil of cinnamon to the warts twice a day for a few days and watch them shrivel up and disappear. Sometimes a long one will harden and hang for some time, but they can be twisted out. Apply with a feather, and get as little on the teat as possible, as it sometimes makes the skin sore. If there are many warts, treat a few at a time, or wait until the cow is dry and clean them off before she is fresh.''—''Queensland Grazier.''

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·22	6·42	5·41	6·20	5·58	5·46
2	4·58	6·45	5·22	6·41	5·41	6·19	5·58	5·45
3	4·59	6·45	5·23	6·41	5·42	6·18	5·59	5·44
4	4·59	6·46	5·24	6·40	5·43	6·17	5·59	5·43
5	5 0	6·46	5·24	6·40	5·43	6·16	6·0	5·42
6	5·1	6·46	5·25	6·39	5·44	6·15	6·0	5·41
7	5·2	6·47	5·26	6·38	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·1	5·39
9	5·3	6·47	5·27	6·37	5·46	6·12	6·2	5·38
10	5·4	6·47	5·28	6·36	5·46	6·10	6·2	5·37
11	5·5	6·47	5·29	6·36	5·47	6·9	6·3	5·35
12	5·5	6·47	5·30	6·35	5·47	6·8	6·3	5·34
13	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
14	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
15	5·8	6·47	5·32	6·33	5·49	6·5	6·5	5·31
16	5·9	6·47	5·32	6·32	5·49	6·4	6·5	5·30
17	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·50	6·2	6·6	5·29
19	5·11	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·12	6·46	5·35	6·29	5·51	6·0	6·7	5·27
21	5·12	6·46	5·36	6·28	5·52	5·59	6·8	5·26
22	5·13	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·14	6·45	5·37	6·26	5·53	5·57	6·9	5·24
24	5·15	6·45	5·38	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5 54	5·55	6·10	5·22
26	5·16	6·44	5·39	6·23	5·54	5·53	6·10	5·21
27	5·17	6·44	5·40	6·22	5·55	5·52	6·11	5·20
28	5·18	6·44	5·40	6·21	5·55	5·51	6·11	5·20
29	5·19	6·43	...	...	5·56	5·50	6·12	5·19
30	5·20	6·43	...	...	5·56	5·49	6·12	5·18
31	5·21	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H.	M.
9 Jan.	●	New Moon	3	27 p.m.
17 ,,	☾	First Quarter	4	31 p.m.
24 ,,	○	Full Moon	9	8 a.m.
31 ,,	☽	Last Quarter	6	2 a.m.

Apogee on 9th. Perigee on 23rd.

8 Feb.	●	New Moon	10	37 p.m.
16 ,,	☾	First Quarter	4	53 a.m.
22 ,,	○	Full Moon	7	33 p.m.

Apogee on 5th. Perigee on 21st.

1 Mar.	☽	Last Quarter abt. m'night		
10 ,,	●	New Moon	4	9 a.m.
17 ,,	☾	First Quarter	1	49 p.m.
24 ,,	○	Full Moon	6	19 a.m.
31 ,,	☽	Last Quarter	7	13 p.m.

Apogee on 5th. Perigee 21st.

8 Apr.	●	New Moon	7	5 p.m.
15 ,,	☾	First Quarter	8	12 p.m.
22 ,,	○	Full Moon	5	50 p.m.
30 ,,	☽	Last Quarter	2	9 p.m.

Apogee on 2nd and 30th. Perigee on 17th at 3 p.m.

ECLIPSES.

An Annular Eclipse of the Sun visible in North of Scotland but not in Australia will occur on April 8th.

An Eclipse of the Moon will occur on April 22nd, when the Moon will rise totally eclipsed.

The Planets Venus, Mars, and Uranus will be remarkably close together apparently on January 9th, and will form a fine celestial picture with the Moon on the 13th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Queensland.

Department of Agriculture and Stock.

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Agriculture.

FIGHTING DROUGHTS.

AN ANALYSIS AND SOME SUGGESTIONS.

By CUTHBERT POTTS, B.A., Principal of the Queensland Agricultural College.

To thinking men this is probably the most important problem facing Australia at the present time. The country has just passed through one of the most extensive and most protracted droughts ever experienced. Losses of live stock have been enormous. Production and reproduction have been lowered. Were these losses merely individual, the majority of us might look on with indifference; but these losses are not individual, they are national. Our national wealth is depleted by each drought and, in consequence, each and every individual in the community has to suffer.

There is no impossibility in devising some scheme whereby we could combat our droughts, but the problem is a national rather than an individual one. Unfortunately, now that the drought has broken, there may be a tendency to forget. During the drought many good resolutions were made to the effect that some preparation must be made to prevent them inflicting on us these enormous losses. We must not forget these good resolutions. Now is the time to organise; and this analysis of the problem is presented, trusting it may serve some useful purpose in maintaining a live interest in the subject. In the latter portion I offer a scheme for financing fodder conservation in the hope that the suggestions there contained may be of some value in assisting to solve the problem.

FUNDAMENTALS.

To begin with, it is necessary to examine our premises. A clear and accurate knowledge of these is essential in order to build solidly and so arrive at any solution of permanent value.

As a basis, it must be recognised that Australia lies in one of the great dry belts of the world. Australia's rainfall distribution and meteorology are comparatively simple, and a thorough study of Dr. Griffith Taylor's works should be made before any scheme for fighting droughts is propounded. With this cautionary advice, we will proceed to make a mere statement of certain salient points. These can be confirmed and amplified as desired.

1. The area of Australia is roughly 1,900,000,000 acres, and some two-thirds of this can be utilised. Probably 600,000,000 acres are suitable for stock only, while another 600,000,000 acres can be used for crops and stock; a small portion only being definitely agricultural. Thus the primary conclusion is, that Australia is and must remain a stock-raising country.

2. The rainfall is erratic, and droughts are constantly occurring. Mostly, these are local in effect but, occasionally, they are widespread.

3. Droughts are Nature's method of giving the land a rest. In our climatology, droughts take the place of the hard winters of Europe, North America, and Asia. Without such rest periods, Nature would run riot or decay. Droughts, then, should be looked on as beneficial and not as a curse (*see* J. J. Fletcher in "Science and Industry," vol. 2, August, 1920, p. 486). If at present we find them disastrous, it is merely because we have not taken them sufficiently into consideration in our pastoral and agricultural organisation. In colder climes the winter rest period is recognised and provided for. In our clime the oncoming drought is not considered, and is unprovided for. The fault is man's—not Nature's.

4. Perhaps it is the regularity of the winter rest periods in colder climes which has enabled agriculture to establish a proper system. Perhaps it is merely the slow accumulation of centuries of experience which has evolved the proper methods; perhaps it is combination of both of these; but neither of these features suits our conditions. Our droughts are not regular in their incidence; they are erratic, and, so far, we have no safe means of prediction. (This may be overcome as the result of careful meteorological investigation.) Further, we have no long period of experience from which to glean a proper working system. But the most important feature is, that we are, or should be, rapidly developing; and this introduces an important variable when successive droughts are placed in comparison.

Under these circumstances there obtains in Australian practice a large element of gamble. In any proposals for fighting droughts this element must be taken into consideration. The tendency towards gambling must be opposed, but it cannot be eradicated for years and years yet to come.

5. Couple the gambling element with the fact of our rapid development, and the natural outcome is that many are induced to start on the land with too little capital. This is not a bad feature, for we must grow, and we want all the grit and courage that lies behind such action. It is, however, a very real difficulty to be faced in any proposal put forward.

6. Whatever may be the final development, at present Australia is almost entirely dependent on pastoral and agricultural production for her annual national wealth. Any failure in this respect is a national calamity; any increased success spells national prosperity. Therefore, this drought problem is of as much interest to the cities as to the country.

7. Though Australia is a land of drought, it is also a rich land, yielding abundantly when rain falls. Further, the rainfall, which on the average is sparse over much of the land, is sporadically abundant. When abundant, the growth of grass and herbage and crops is superabundant; also, great floods occur. Of these two features, the flood waters appeal most to the popular eye. Hence we hear a great deal about water conservation and irrigation in times of drought, and but little about fodder conservation. But fodder conservation is undoubtedly the more important, as is indicated in the following analysis.

IRRIGATION COMPARED WITH FODDER CONSERVATION.

Let us consider irrigation first. To begin with, we have to recognise that Australia possesses no great range of snow-clad mountains. Therefore we are lacking Nature's provision for the conservation of water. When we wish to conserve water, we are compelled to fall back on great storage dams, such as that at Burren Juck or that proposed at Mitta Mitta, at the head waters of the Murray. Suitable sites for such dams are limited, because several essential conditions have to be complied with. First, the dam must be in a narrow outlet to a large flat valley, so that a comparatively small dam will impound a large quantity of water. Second, the rock structure at the dam site must be impervious to water, otherwise seepage round and under the dam would destroy its effectiveness. Third, the intake or catchment area must be so large that the rainfall received thereon shall be sufficient to fill the dam. The out-take from the dam must be strictly in accord with the average rainfall over the catchment area. Hence the size of the dam in relation to the area to be irrigated must be increased just in so far as the rainfall on the catchment area is more erratic. In other words, the more erratic the rainfall, the more difficult and expensive to establish storage dams for irrigation, even provided suitable dams sites can be found. On this account, water conservation for irrigation will be restricted to certain specially favoured areas—areas of small variability in rainfall. (*See* Dr. Griffith Taylor—"Australian Environment: Map of Rainfall Uniformity," p. 23.) In truth, the irrigable area of Australia will almost certainly lie mainly in the south-eastern quarter. At best it has been estimated (by Mr. Elwood Meade, I think) that the possible irrigable area of Australia will not exceed 6,000,000 acres.

This is only 1/200th part of the 1,200,000,000 acres which can be occupied, and but 1/100th part of the area definitely committed to grazing.

But there is another phase to the subject. Suppose that large irrigation settlements were established, could we expect that the irrigationists would grow fodder in large quantities for sale? I don't think so. If we assume that our major droughts hit us once in each five years, we have this position: For four out of the five years, fodder grown under irrigation could not hope to compete with that grown under natural rainfall conditions. Therefore, for four years the irrigationist would have to store his fodder, trusting to the higher prices in the fifth year to recoup him for his work and waiting. Some scheme of credit would be required whereby stored fodder would be accepted as security for a loan. But if such financial assistance were given to the irrigationist, why not extend it to the farmer working under natural rainfall conditions, and so obtain the conservation of fodder from the cheaper system of production?

In itself irrigation must play a big part in our national welfare, but we cannot expect irrigation to play any very large part in the solution of our drought problem, especially with reference to fodder conservation for live stock. Each irrigation settlement, as it is established, must be expected to evolve its own scheme of operation. Each settlement will engage in, say, fruitgrowing or dairying, or topping off lambs, or in some other type of agriculture which will yield a large annual return, so that when the drought comes, we must expect to find irrigationists fully occupied in their own work and in no way concerned in the production of fodder for starving stock.

FODDER CONSERVATION.

If the above argument is correct, we are forced back on to the second point—viz., that there is a superabundant growth of herbage, grass, and crops when the rainfall is good. When we remember that, in a good season, this growth extends over an area of some 1,200,000,000 acres, the enormous possibilities in fodder conservation are immediately evident. These possibilities far outweigh any conceivable possibilities under irrigation.

In making this statement, it is not contended that we could conserve anything like the full measure of our surplus growth in a good season, nor is it contended that it would pay to hand-feed the whole of our live stock during a drought period. Thus:—

First: The demand for labour to conserve much of the growth in the western country would be as sporadic as our seasons, and it could not be hoped that this demand could be satisfied.

Second: It is not necessary to attempt to feed the whole of the stock. In any drought we only lose a percentage of our live stock. The removal of this percentage by death relieves the land to such an extent that the remainder pull through. If, then, at the commencement of a drought, we hand-feed those stock which were well forward in condition, and those females which were heavily pregnant, we would, in effect, be removing from the land a sufficient number to so relieve the situation that the remainder would weather out the drought. Treated from this standpoint, there is every probability that fodder conservation and the hand-feeding of stock would pay.

Third: While fodder conservation in the western country may not be feasible, fodder production and conservation in the farming districts is possible. Further, stock water could generally be assured in the farming districts.

So far an attempt has been made to concentrate attention on what is undoubtedly the essential feature of this problem of drought resistance—viz., fodder conservation. This is the major factor in any endeavour to stabilise our production as against our variable rainfall.

Later, an attempt will be made to analyse the factors controlling fodder conservation; but, before proceeding, it is necessary to handle another phase of the matter—viz., railway communication.

It has been pointed out above that Australia lies in one of the great dry belts of the world; that droughts are always with us, but that, usually, they are limited in effect and local in their incidence; occasionally they are extended. Yet even in our worst droughts, some parts of the country are unaffected; some portion has an abundance of natural growth. Obviously, therefore, much loss could be avoided if our live stock could be readily and cheaply transported to where the feed exists. This means of meeting the problem has been so often and so ably advocated, that there is little need to go further. What is required is a network of railways through the back country, laid out with full consideration as to their strategic effect in combating droughts.

The conclusion that a proper system of railways would greatly assist in fighting our droughts, is easy to arrive at, but would they return a payable annual revenue? This raises another aspect to the whole problem—viz., the question of finance. It is necessary, therefore, to consider irrigation, stock water, stock railways, and fodder conservation from the financial standpoint before we can proceed with the discussion.

THE FINANCIAL ANALYSIS.

Irrigation.—When we build great storage dams for conserving water for irrigation we are making a provision whereby a free gift of Nature, our rainfall, is made more potently available. The original work is undertaken by Government, and the redemption and the annual cost of upkeep are recovered by a revaluation of the land served, together with annual water rates, &c.

Stock Water.—Conservation of water for stock purposes is very similar to that of conservation of water for irrigation, from the financial standpoint. It is an attempt to utilise more fully a free gift of Nature, our rainfall, whether surface or subterranean. In this regard much can be done by private enterprise, but where Government is asked for assistance, such assistance should be forthcoming, provided Government is fully protected as to recovery of the outlay by a direct lien on the area, or persons or stock served.

In the wide expanse of Australia's pastoral lands, however, there will be found some places which demand a provision for stock water, but which are so placed that private individuals will not undertake the work. Such places would lie on lines of transport or communication. Here Government would have to undertake the work, but it would be difficult to allocate any specific area or persons served. Therefore any direct charge for the recovery of the outlay would be difficult. Perhaps, in such cases, it were better for Government to make a gift of such works to the industry, recognising that a recovery will be made indirectly through the increased prosperity of that industry.

A Network of Railways through the back country for the purpose of easy and rapid and cheap transport of stock in times of drought is, in its essentials, another attempt to utilise more fully a second free gift of Nature—viz., our natural pasturage. This is a project justly undertaken by Government, but, as with irrigation, the area or industry or persons served should find the annual revenue. This network of railways has often been advocated, but without taking this point sufficiently into consideration. Instead, there has been rather a general feeling that such strategic lines of rail would be on a parallel with other railways; but they would not. An ordinary line of rails is built with the object of developing some district, it being anticipated that, as the district developed, so profits will be obtained from freights and fares. No such anticipation can be made with reference to the drought-fighting railways suggested. The revenue from such railways can only be expected during times of drought—times when the average stockman is looking for a concession in freights rather than anything else.

If this strategic system of railways is to be constructed it must be considered on the lines similar to those for an irrigation settlement—*i.e.*, those served must be charged with the redemption of the outlay, the interest on capital expenditure, the cost of annual upkeep, and the service rendered. This necessary annual revenue might be obtained by a direct charge tax on the area served, or a tax on the stockowners direct, or a per capita tax on the stock held.

The latter is considered the more equitable because it is likely to distribute the cost of upkeep in accord with the probable service to be rendered. Of course, if such an arrangement were arrived at, Government would have to undertake to transport stock in times of drought at some predetermined rate. Further, Government would have to undertake that, if the revenue from ordinary traffic more than covered the costs of operation for any year, such revenue would be deducted from the direct charge made on the stock owners.

In this respect it is interesting to note that about 1893 we carried in Australia 90,000,000 sheep and some 12,000,000 head of cattle. This was our maximum, but, with proper organisation, is there any reason why we should not reach or even exceed these numbers. But if we accept these numbers as a possible stock holding, then a direct tax of 3d. per head on sheep and 1s. per head on cattle (horses have not been taken into account) would yield an annual revenue of £1,725,000, an amount which should certainly be sufficient to finance any system of drought-fighting railways that might be suggested.

This matter of a stragetic system of railways for the purpose of combating droughts deserves every consideration, but it can only be approached from the standpoint of a direct charge on those served. As with irrigation, the Government

may be expected to find the money for the construction, but the stockowners would have to find the greater portion of the annual revenue to cover upkeep and running charges.

Fodder Conservation.—With fodder conservation we immediately meet with distinct differences and in these differences we find our difficulties.

Fodder crops are *not* a free gift of Nature. *The production of fodder is largely the result of man's labour.* Hence the amount of fodder which may or may not be produced is dependent on conditions other than the natural rainfall, the quality of the soil, &c.

Allowing for seasonal variations, it can be taken that the amount of fodder which the farmers aim at producing is largely determined by the probable profits they may get. Farmers will not willingly over-produce, as they know that by so doing they are likely to glut the market, and thus be forced to sell their produce at a loss on their year's operations.

If farmers were organised so that they directed their efforts towards the growing of crops in quantities in true relative proportion to the annual demand, and, if many of the farmers were in such a strong financial position that they could afford to hold their produce over from the time of plenty in the full-growing season until the time of shortage in the non-growing period, gluts in the market would be largely avoided but beyond this there would be a fairly safe guarantee that a truly full annual supply would be produced.

But, in actual practice, we find little combination amongst farmers, hence glutted markets do occur. The least consideration, however, will indicate that such gluts are not due to the production of any annual surplus of fodder; they are due to the seasonal surplus which results because most farmers are so placed, financially, that they are compelled to sell their produce in the flush of the growing season. Selling on a glutted market implies the probability of selling at a loss on the cost of production; therefore, the existing conditions insist that, on the average, there shall be an under rather than an over production in any one year.

To emphasise this we might take lucerne as an example. This crop usually falls to an unprofitable price (from the producer's standpoint) during the summer but recovers to a fair payable price during the winter. The whole year, however, finds no surplus. Maize is another crop which is peculiarly subject to these seasonal fluctuations of value. Prices for maize at the time of the full harvest are generally so low that those farmers who are compelled to sell find that they have produced at a loss. The natural result is that they restrict their operations. Therefore, though Australia, and Queensland in particular, is eminently suited for the production of maize, we do not normally grow a sufficiency of this crop to meet our own year's requirements.

The conditions appertaining to the production and marketing of the above crops (and there are many other crops similarly conditioned) invite a system of speculation. Therefore, it is not surprising to find that city merchants are buying up on the low seasonal market and holding for the higher off-season market. The operations of these speculators are certainly of some value in so far as such operations have a tendency to hold up prices on a glutted market. But with reference to fodder conservation these speculative operations are most disastrous. Obviously, the security for the speculator lies in an under production for any one year, while the necessity for fodder conservation is an over production in every good year.

Consideration of this point is fundamental to the success of any organised scheme for fodder conservation. The farmer must be induced to grow a real annual surplus, and he can only be persuaded to do this by ensuring that his work will be sufficiently profitable.

Passing from the farmer to the stockmen, we have the former as a producer and the latter as a consumer. Thus, with regard to fodder conservation, we have a problem which is governed by the ordinary laws of supply and demand.

If the stockowners were well organised, and created a definite and consistent demand for fodder (not the unthinking periodic demand now caused by our droughts), the farmers could and would supply up to the limit of profitable production. In such a definite division between consumer and producer we would have a strictly commercial arrangement, wherein the stockowners as a body had replaced the existing speculating merchants. This move would be of undoubted value, because the element of time would be introduced. The stockowners would aim at a gradual accumulation of fodder over a number of years; they would be demanding an annual surplus of production in good years, which surplus they could only hope to obtain by making the transaction profitable to the producing farmer. Our speculating merchants, on the other hand, have no such ultimate objectives. They merely aim at the greatest

profits in the shortest time, and, automatically, they are against the full production in any one year, let alone a surplus production in, say, four out of five years.

If it were possible to organise such a strictly commercial arrangement between the stockowners, on the one hand, and the producers of fodder, on the other hand, there would be no necessity or right to fall back on the Government for assistance; but it is more than doubtful if any such organisation could be sufficiently perfected to render it workable. The element of distributed management enters too largely into the industries of both stock-raising and farming. Further, on many properties we have no clear distinction between the two sections—*i.e.*, we have many farms where both farming and stock work are carried on conjointly. Thus there is every indication that this important problem of fodder conservation must be solved along some lines of co-operation, and in this regard Government assistance is both justifiable and necessary.

Briefly, fodder conservation resolves itself into the following basic elements:—

1. We have a section committed to farming operations only. This section could and would produce a large surplus of fodder in good seasons provided it were demonstrated that such production would be profitable. For future argument, call this group Section A.
2. We have another section who are carrying on both farming and stock-raising on the same property. These men also require to conserve fodder for their own stock as against possible droughts. Let us call these Section B.
3. We have those who are engaged in pastoral work only—that is, men who are so placed that it is practically impossible for them to conserve fodder for their own use, yet who will require fodder in times of drought. We will call these Section C.

Combined, these three sections form the greatest element in our primary production, and their united efforts constitute the greatest factor in the production of our annual national wealth. The disturbing factor is the drought.

In good seasons, Section A could produce an annual surplus of fodder, but does not do so because there is no provision made to finance him over the period of "waiting."

Section C knows it will require surplus fodder in times of drought, but, largely because of lack of organisation, it makes no provision to see that such surplus is conserved.

Section B is a growing element, and is interested in the problems of both other sections. It is this element which is likely to force the whole problem on to co-operative lines.

SUMMARY.

Just here it might be of advantage to make a brief summary of the foregoing arguments.

Water Conservation and Irrigation is justly undertaken by the Government. It is a justifiable attempt made by the nation to obtain a better service from a free gift of Nature—*i.e.*, from our rainfall. In Australia such undertakings belong to the Government rather than to the individual, because the peculiar nature of our climatology and physiography renders a large initial outlay necessary. In such projects, the Government recovers by a direct charge on the area served, *i.e.*, by annual water rates, &c.

Water Conservation for Stock Purposes, whether by dams or wells or bores, is quite similar to irrigation in so far as it is an attempt to obtain a better service from a free gift of Nature. In this case, however, private enterprise can do much. But if the Government is asked for assistance, such assistance should be forthcoming, the Government recouping itself by a direct charge on the area or persons or stock served. This is strictly in accord with the practice for irrigation settlements.

A Network of Railways Strategically Placed for the Rapid Transport of Stock in Times of Drought.—Here, again, we have an endeavour to utilise more fully a free gift of Nature—viz., our natural pasturage. This matter is entirely similar to that of irrigation. A large initial outlay is necessary for construction; the Government must undertake the work and be recouped by a direct charge on those served.

Such a network of lines could not be expected to pay, in the commercial sense of earning an adequate annual revenue to cover interest and working expenses; but such railways would be to the pastoral industry what water would be to an irrigation settlement—it would render stock-raising more certain and more profitable, but not quite in the same degree. Therefore, if such a net of railways were built,

there must result a direct charge on the pastoral industry for at least a portion of the annual revenue required. Another portion must be borne by the Government on behalf of the general community, who will benefit by the increased prosperity of the pastoral industry. Of course, if such railways earn any commercial revenue, the charge against the pastoral industry should be reduced by that amount, and, with time, this reduction may be large or even complete.

Fodder Conservation is quite different from any of the above, because we have now to consider what is the result of man's labour, rather than the better utilisation of a free gift of Nature. This section of the problem is governed by the laws of supply and demand, and it cannot be expected that there will be any regular or sufficient supply of fodder except in so far as it is made profitable for the farmer to produce it. Exactly the same argument applies to the production of fodder on an irrigation settlement except that, in this latter case, the cost of production is more expensive than under conditions of natural rainfall. Therefore, we cannot hope that irrigation settlements will play any considerable part in this problem of fodder conservation.

Were it possible to thoroughly organise both the suppliers of fodder (the farmers) and the consumers of fodder (the stockmen), this whole problem would become a purely commercial transaction which would adjust itself without Government assistance. But, in rural work, such thorough organisation is quite improbable of attainment, for the simple reason that both farming and grazing are extensive in their operations and are committed to distributed and independent management as opposed to manufacturing, where the tendency is towards concentration of effort and centralised control and management. Therefore, and chiefly because agriculture means so much to our whole community with regard to the production of our annual national wealth, it is incumbent on the Government to intervene. In this case, however, the Government cannot act as for irrigation, or for stock water, or for stock railways. Instead, the Government must direct its efforts towards establishing some system of co-operation between the two big sections of our primary production, recognising, with regard to fodder conservation, that the stockowner is the consumer and the farmer is the producer.

Before proceeding to outline a tentative scheme for financing fodder conservation, it is necessary to refer to several other points which are well illustrated in Dr. Griffith Taylor's works on "Australian Environment" and "Australian Meteorology." From these works it will be fully recognised that the area for the possible growth of fodder crops is restricted, more or less, to the south-eastern quarter of the continent and to an area paralleling fairly closely our eastern seaboard. Also, that much of the area suitable for the production of stock is not suitable for the production of crops.

Again, the more southern areas are subject to winter rains and, consequently, are more suited for the production of wheat and oats, both of which can be converted into a permanent hay crop which can be transported over long distances without deterioration. From well south and extending up the eastern coast to the north of Brisbane, we can grow lucerne which also can be converted into one of the very best of hays, again possible of transport over big distances without deterioration. But going further north, much of the growth will be on the summer rainfall, and will include such summer crops as Sudan grass, Japanese millet, panicum, maize, and sorghum. Many of these crops can be converted into hay and so are capable of transport over long distances, but much of this produce would be better converted into silage, which is perishable as soon as it is removed from the silo or the stack.

Therefore, while it may be better to transport the fodder to the stock in the south-east of the continent, it is more than probable that the stock will have to be transported to the fodder in our northern areas.

This point may not be of great importance at the present juncture, but it will undoubtedly have a modifying effect on any completed scheme for fodder conservation.

FODDER CONSERVATION.

We are now in a position to discuss some of the features of a scheme for fodder conservation.

In times of drought it is the stockowners who are chiefly concerned. It is the live stock industry which is liable to the big losses, and it is from this industry that there arises a sudden and large demand for fodder. In times of drought the farmer is not so largely concerned. For him, his loss is merely the year's operations. For the stockmen it is different, because the losses threatened are for more than a year's operations. Each animal takes more than a year to develop. Thus it is natural to find that most of the schemes for fodder conservation up to the present have been propounded by the graziers.

Some of these schemes advocate direct action by the Government in the direction of buying up fodder and the establishment of great fodder conservation dumps.

Other schemes advocate direct action by the graziers for the creation of their own fodder reserves. There are still other suggestions midway between the above—that is, schemes asking for Government assistance to a grazier's fodder conservation fund.

In the best of these schemes ample provision is made to protect the Government against loss, but in no case have I found the farmer, the producer of the fodder, taken fully into consideration. Because of this, it is doubtful if any of the schemes for fodder conservation, so far suggested, could hope to succeed.

Let me take a scheme recently published in the "Sydney Morning Herald." It is quoted as one of the best, and as one of the most practical. The scheme is as follows:—

1. That the graziers should subscribe to a fund for the purpose of purchasing fodder in times of plenty, which fodder is to be held against the oncoming drought.
2. That the Government should supplement the above fund £1 for £1.
3. The total sum aimed at for each year to be £1,000,000. This sum to be placed under the management of three thoroughly practical and reliable men for the purpose of purchasing fodder, which fodder is to be stored at points specially selected with reference to easy and rapid transport.
4. The farmers to be paid a fair price and to be circularised so as to enable them to produce a sufficiency of material. The delivery of the fodder to be taken a few months after stacking and on being passed after examination by an expert.
5. Each grazier subscribing to the fund to have a prior lien on a quantity of fodder, I take it, in proportion to his subscription.

There are other conditions incidental to the scheme, but which have no bearing on the present discussion.

[TO BE CONTINUED.]

"THE CULTURE OF TEMPERATE FRUITS IN QUEENSLAND."

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture, Queensland.

For some years after fruit-growing became one of the staple industries of Queensland, the attention of orchardists was, at least in the tropical and semi-tropical parts of the State, mainly centred on citrus fruits such as oranges, lemons, citrons, shaddocks, mandarins, together with custard apples, mangoes, guavas, granadillas, bananas, passion fruit, &c. Almost the whole of the literature on fruit-growing was confined to advice as to the treatment of such fruits. Gradually, however, it was found that, in certain districts, particularly on the Darling Downs, the fruits of temperate climates could be produced in as great perfection as in cold countries. Amongst these may be mentioned apples, pears, plums, peaches, apricots, quinces, nectarines, figs, walnuts, quinces, pecan nuts, cherries, strawberries, and many others.

It is the latter fruits that the author has exhaustively and clearly dealt with in the hundred and nineteen pages which are entirely devoted to them, commencing with a description of the districts suitable for their cultivation in respect to climate, soils, rainfall, &c. Directions are given for the selection of an orchard site; the preparation of the land in the matters of breaking-up, subsoiling, drainage; laying out the orchard; planting the trees; their subsequent cultivation; propagation by various means such as from seed, cuttings, budding and grafting; irrigation, manuring, and subsequent treatment for the destruction of insect pests, fungoid disease, &c.; and the different treatment of each variety of fruit tree, nuts, and berries.

Nor has the market garden been overlooked, several pages being devoted to the cultivation of most of the culinary vegetables, followed by copious notes on insecticides and fungicides. This book should be in the hands of all fruitgrowers and market gardeners, and can be obtained from the Department of Agriculture and Stock; price, two shillings.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, DECEMBER, 1920.

The weather conditions for the month have been extremely trying for the birds. Daily throughout the period the shade temperature has been in close proximity to 100 degrees. During the last week temperatures of 104 degrees, 107 degrees, 108 degrees, and 110 degrees were registered in the shade on the College poultry plant. This trying weather has caused a big drop in the egg yield. Broodiness has been very troublesome, and three pens in the light groups had three birds apiece in the broody coops at the one time. There are a few odd birds dropping feathers, these being White Leghorns that have been troublesome with broodiness. There have been six deaths during December, viz.—N. A. Singer's C., L. G. Innes's E. (both ovarian disorders), H. Chaille, Mrs. R. Hodge, E. F. Dennis's A., and T. Gaydon's F. died from heat apoplexy. There were 15 birds requiring attention owing to the excessive heat on the 28th, when the shade temperature on the poultry plant registered 110 degrees. Lavish watering of the pens had to be resorted to in order to give the birds a little comfort. Several nights during the month were extremely close, and very heavy breathing was quite audible whilst walking past the pens. The following are the individual records:—

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS.			
*G. Trapp	White Leghorns ...	133	1,179
*Haden Poultry Farm	Do.	129	1,173
*O. W. J. Whitman	Do.	121	1,156
*J. D. Newton	Do.	130	1,130
*J. M. Manson	Do.	118	1,128
Geo. Lawson	Do.	126	1,127
*Quinn's Post Poultry Farm	Do.	133	1,124
*J. J. Davies	Do.	122	1,120
*N. A. Singer	Do.	134	1,108
*Dr. E. C. Jennings	Do.	136	1,107
*W. Becker	Do.	130	1,104
*L. G. Innes	Do.	124	1,086
*E. A. Smith	Do.	135	1,070
*T. Fanning	Do.	147	1,070
Mrs. R. Hodge	Do.	126	1,066
*G. Williams	Do.	128	1,063
*J. H. Jones	Do.	125	1,060
*H. Fraser	Do.	121	1,054
*W. and G. W. Hindes	Do.	106	1,045
*Mrs. L. Anderson	Do.	127	1,037
B. Chester	Do.	129	1,029
*S. McPherson	Do.	102	1,022

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Dec.	Total.
	LIGHT BREEDS—*continued.*		
*Thos. Taylor	White Leghorns ...	131	1,009
S L. Grenier	Do.	117	1,009
*Mrs. L. Henderson	Do.	124	1,004
*Range Poultry Farm	Do.	107	984
Thos. Eyre	Do.	102	978
*S. W. Rooney	Do.	81	958
B. Chester	Do.	112	935
Avondale Poultry Farm	Do.	97	925
H. P. Clarke	Do.	100	905
W. Morrissey	Do.	82	901
R. C. J. Turner	Do.	93	896
C. Langbecker	Do.	119	895
S. Chapman	Do.	123	892
C. M. Pickering	Do.	108	868
H. A. Mason	Do.	109	854
W. D. Evans	Do.	101	846
C. H. Towers	Do.	80	845
A. J. Andersson	Do.	82	818
C. A. Goos	Do.	116	816
Miss E. M. Ellis	Do. Pen with	drawn	583
	HEAVY BREEDS.		
*R. Burns	Black Orpingtons ...	124	1,149
*E. F. Dennis	Do.	114	1,142
*A. Shanks	Do.	110	1,126
*R. Holmes	Do.	101	1,123
*E. Morris	Do.	108	1,077
*A. Gaydon	Do.	105	1,074
*D. Fulton	Do.	87	1,067
*W. Smith	Do.	93	1,025
H. M. Chaille	Do.	96	1,018
*J. A. Cornwell	Do.	128	1,017
*A. E. Walters	Do.	99	1,013
*E. Oakes	Do.	109	1,002
*T. Hindley	Do.	102	975
J. E. Smith	Do.	78	952
Parisian Poultry Farm	Do.	113	952
*R. B. Sparrow	Do.	101	951
Mrs. G. H. Kettle	Do.	95	937
R. C. Cole	Do.	96	918
G. Muir	Do.	82	902
*E. Stephenson	Do.	81	851
*J. E. Ferguson	Chinese Langshans ...	75	847
*Nobby Poultry Farm	Black Orpingtons ...	81	847
G. Flugge	Do.	91	743
Total	...	7,035	64,607

* Indicates that the hen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
			LIGHT BREEDS.				
G. Trapp	20[illegible]	196	209	186	201	181	1,179
Haden Poultry Farm	218	165	217	205	180	188	1,173
O. W. J. Whitman	185	181	213	194	173	210	1,156
J. Newton	216	180	194	139	197	204	1,130
J. M. Manson	179	198	205	190	181	175	1,128
Quinn's Post Poultry Farm	209	194	192	184	163	182	1,124
J. J. Davies	198	189	188	186	185	174	1,120
N. A. Singer	189	169	185	212	182	171	1,108
Dr. E. C. Jennings	157	210	173	171	185	211	1,107
W. Becker	193	187	203	183	159	179	1,104
L. G. Innes	187	178	190	200	206	175	1,086
E. A. Smith	180	157	195	175	178	185	1,070
T. Fanning	91	192	188	196	205	198	1,070
G. Williams	171	180	181	175	202	154	1,063
J. H. Jones	177	174	182	190	184	153	1,060
H. Fraser	147	179	190	187	184	167	1,054
W. and G. W. Hindes	169	181	149	188	174	184	1,045
Mrs. L. Anderson	200	186	185	165	151	150	1,037
B. Chester	178	151	182	169	177	172	1,029
S. McPherson	201	202	91	127	211	180	1,022
Thos. Taylor	193	176	139	183	160	158	1,009
Mrs. Henderson	150	165	177	161	187	164	1,004
Range Poultry Farm	120	165	176	196	158	169	984
S. W. Rooney	140	136	183	144	176	179	958
			HEAVY BREEDS.				
R. Burns	190	176	222	171	202	188	1,149
E. F. Dennis	206	178	175	208	176	199	1,142
A. Shanks	162	194	174	221	155	220	1,126
R. Holmes	174	199	192	179	198	181	1,123
E. Morris	182	185	191	147	187	185	1,077
A. Gaydon	183	221	181	155	139	195	1,074
D. Fulton	184	187	172	194	92	238	1,067
W. Smith	110	213	188	181	171	162	1,025
J. Cornwell	173	196	177	120	159	192	1,017
A. E. Walters	156	170	156	187	147	197	1,013
E. Oakes	152	204	169	94	189	194	1,002
T. Hindley	179	196	162	174	123	141	975
R. B. Sparrow	177	107	178	156	146	187	951
E. Stephenson	168	133	159	150	125	116	851
J. E. Ferguson	108	149	110	135	191	154	847
Nobby Poultry Farm	160	221	83	224	139	20	847

CUTHBERT POTTS,
Principal.

THE DWARF COCONUT.

With reference to our article on the dwarf coconut, published in the December issue of the Journal, we are indebted to Mr. Charles Booth, Stadium, Mitchell, for the information that several excellent specimens, which bear prolifically every year, having a length of trunk of about 9 feet (inches ? Ed.) are to be found in the village of Kerepuna, in the Central Division of Papua. The nuts are retailed by the owners at 1s. per nut for seed. They have quite a good thickness of kernel and are of a bright orange colour. Mr. Booth added that he had never heard of any of the seed planted coming to anything, but made the experiment of planting several of the nuts, but they all "missed."

Tropical Industries.

THE QUEENSLAND SUGAR INDUSTRY.

The "Queensland Sugar Journal," which always gives to those interested in the sugar industry and in other matters connected with agriculture very useful information on these subjects, publishes the following *resumé* of the past year's work in the various sugar districts:—

"The 1920 sugar season is now practically at an end, and the figures of the Government Statistician and those of the General Superintendent of Sugar Experiment Stations practically agree in estimating the output at something over 163,000 tons of raw sugar. This is slightly better than the yield for the previous year; but very far short of the 1917 figures, which reached 307,714 tons. It has to be remembered, however, that the past season's crop has suffered under several disabilities of a very severe nature. In the first place, the drought of 1918-19 broke at too late a date in most of the districts to admit of anything like normal growth in the cane; also, the blighting influence of the restricted price of sugar since the war commenced, together with heavy losses both from cyclone and frost, were all operating against the success of the crop just harvested. Happily, the rain came in time to afford material relief in most districts, and the crop was distinctly better than was anticipated a few months ago. Had plantings been larger, or in other words had the relief in prices come in 1919 instead of well into 1920, there would have been a still better result, notwithstanding the dry weather. Most of these disabilities have been removed, and the prospects are just now brighter than they have been for a number of years past.

"The Secretary of the Australian Sugar Producers' Association, Mr. G. H. Pritchard, returned just before Christmas from one of his periodical visits to the Northern sugar districts. At every place visited—and his tour covered the whole of the areas from Mossman down to the Herbert River—the crops were looking exceedingly well, and the prospect in all cases was that the sugar production for 1921 will show a very substantial increase on that of the season just closed. It was evident that every effort is being made on the part of individual farmers towards implementing as far as may lie within their power, the promise made by the delegation which waited on the Prime Minister early last year, that, in view of the increased price offered for their sugar, they would endeavour to secure larger crops next year, in order fully to supply the sugar requirements of the Commonwealth. We may confidently anticipate, that should no unforeseen adverse circumstances arise, there will be a very largely enhanced tonnage of sugar available by the close of the year now current. Arrangements are being made at all the mills of the Colonial Sugar Refining Company to enlarge the supply of cane available; and as a further evidence of confidence in the future of the industry, it may be noted that the Mulgrave Central Mill Company have decided to spend £130,000 in improving their mill and in extending the area from which its cane supplies are drawn. To give effect to this, an adjustment of areas has been agreed to amongst the suppliers to the Hambledon and Mulgrave Mills, with a view of shortening the haulage where possible, and so facilitating the harvesting operations. Other mills have various improvements and additions in hand; and it may be assumed that the annual overhaul both of mills and tramlines will this year be unusually thorough, in order to avoid as far as possible the risk of breakdown or other delays.

"Mr. Pritchard found also that in all the districts visited, farmers were doing their best towards acquiring the latest labour-saving implements; and it is a feature worth mentioning that Queensland is by no means behind other cane-growing countries of the world in the invention and use of cane planting and cultivating machinery. Indeed, we are distinctly in the van in these matters, as inquiries from various directions concerning apparatus in use here have sufficiently proved. It was also made evident that where the cane farmer is able to finance the proposition, he is in very many instances strongly disposed towards the purchase of farm tractors. We are safe in asserting that, in spite of all the adverse conditions of the past few years, there are at present far more tractors in use in the Northern canefields than in any similar area devoted to other crops within the State, and probably also one might go further and say—within the Commonwealth. Numerous demonstrations have been given by the agents of various farm tractors, and there are some half-dozen makes of tractor now in practical use, and being thoroughly tested out as to their adaptability to the work of the canegrower. It may be said that as a rule, the users of these tractors speak very highly of the value of mechanical power as against horse teams in the field.

"Another noticeable and altogether satisfactory feature coming under Mr. Pritchard's notice wherever he went, was the desire of the growers to use fertilisers in improving the tonnage and richness of their cane, together with other up-to-date methods which have proved themselves in the experience of the different districts. The element of quality in determining the commercial value of the cane is more fully recognised than hitherto; and apart from the seasonal influences at work, it has been noticeable during the past year that varieties of cane are becoming increasingly popular, not so much on account of heavy tonnage as of the c.c.s. content. In the Mossman particularly, this year, the results thus attained have been specially good; and attention to this phase of their business cannot but prove highly advantageous both to the grower and to the industry in general.

"On the whole, notwithstanding a number of unfortunate exceptions, the season has passed with considerably less in the way of labour troubles than we have been accustomed to in recent years. Labour has everywhere been plentiful, and men, returning year after year to take advantage of the highly favourable terms offered them in Queensland canefields, are not as a rule disposed to waste their time and opportunities by senseless strikes over minor details. At the same time, especially towards the close of the season, the burning of cane has been far too general. Of course, in some instances, this is done with permission, in order to facilitate operations; but there have been a number of instances where cane has been burned contrary both to the wishes and to the financial interests of the grower. In these cases the object has been all too apparent in the demands immediately afterwards made for extra cutting rates considerably in excess of the award which makes full provision for crops in any sense abnormal, such as those on loggy or stony ground, or where the cane has become badly tangled. Unfortunately this practice on the part of the cutters has become far too common in the North; and unless means are found of minimising the evil, it will inevitably prove an ever increasing source of mischief all round.

"Mr. Pritchard emphasised the improved tone and happier outlook of cane farmers in all the districts visited, though in view of losses suffered in the past, and the unjustifiable holding down of prices since 1914, there is manifest a feeling that the price now paid for raw sugar is not in any sense to be regarded as excessive. As already shown, it has been sufficient to greatly encourage cane production; and provided the labour factor in the industry can be induced to take a reasonable view of what, after all, are mutual interests, there is every reason for a hopeful view of the industry. In spite of all drawbacks, and many cases of individual hardship, the past season has been such as to materially assist many of the growers; and with anything like favourable weather conditions from now on, there should be a very substantial backing within the next twelve months to our earnest wish for all our readers that they may enjoy the blessing of A HAPPY NEW YEAR."

THE NORTHERN AND CENTRAL SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

"Throughout the month cane areas at Babinda, Gordonvale, Hambledon, and Bundaberg have been visited.

"BABINDA.

"The cane returns from Babinda this year have surprised even the most optimistic of six months ago. The mill has been going in full swing since the beginning of the season, and there does not seem much chance of finishing before the end of January. Good density and tonnage per acre have been a gratifying feature this crushing, and judging by the flourishing appearance of the young plant cane, and the areas planted, the next season should be a record one for Babinda. Everywhere the farmers are busy, either cultivating or clearing and burning off. A good deal of new land is being reclaimed from the scrub out the Russell River way, where the soil is exceptionally rich and should pay the farmers well for the heavy work required to clear the dense undergrowth and big trees. The land on the river and at Moolibah is a heavy deep loam, very rich in vegetable matter and free to a great extent from the acidity that usually prevails in soils that have been growing cane for any length of time.

"Badila grows exceptionally well here, and many farms look a picture. Cane pests up to the present are not giving the growers any trouble, although they are present in patches. With regard to the latter, there has lately been an emergence in the North, and in some places the beetles are numerous, but whether it is from the fact that the Moolibah and Russell River soils have abundant organic matter, or from other causes, very little damage has been done by these pests.

"Immediately round Babinda the growers are actively cultivating, and, in addition to Badila, Green Goru (24 B) is making a good showing. It is probable, though, that canes like Q. 855, Hybrid No. 1, Q. 813, and D. 1135 would also be worth planting on these areas more extensively than is being done at present.

"Most of the areas in the vicinity of the mill are small, but Dr. Knowles is preparing to plant between 300 and 400 acres. Considering the expense of clearing and burning, &c., he is to be commended for his enterprise. This gentleman also takes an active interest in the latest methods of cultivation, fertilising, and variety experiment. In fact, the interest taken by the rank and file of the growers in scientific agriculture is one of the most pleasing features in the North, and the result is noticeable wherever one goes, in farm innovations and different experiments being carried out on a small scale.

"With regard to noxious weeds, summer grass causes the hoe to be frequently used. No other grasses, indigenous or introduced, are giving much trouble. There is a general feeling amongst the growers that the borer pest has been greatly checked by the parasite flies recently released by Dr. Illingworth. From observations made there is every reason to believe this is so.

"In contrast with other places visited farther South, the leaf of the cane in the Babinda district is healthy, and gumming was not found. Keeping this before them, the growers, if they wish the healthy state to continue, require to exercise care in plant selection, and carefully supervise planting, if done by hired labour.

"GORDONVALE.

"The prospects for the industry are very bright at Gordonvale. The farmers have rich soil to work on, and it is fairly easy to cultivate and drain. The milling accommodation and the tramline are adequate so far, and general satisfaction prevails as the result of this year's run. Next year a record crop is expected. Badila is the staple cane growing, and the strike of plant cane is very satisfactory. The grub pest is a considerable problem, and in addition to using arsenic the growers are endeavouring, where possible, to change their varieties, using more highly resistant canes like D. 1135 on the more badly infested fields. Good results with regard to poisoning are being obtained with carbon bisulphide. Up to the present the commercial application of this chemical has been the difficulty, but a Mr. Dawson of Gordonvale, has invented and tried a machine which seems to be expeditious and economical in this respect. Any growers wishing to get particulars of this implement could get in touch with this gentleman by writing direct to him, or through the secretary of the local Farmers' Union.

"Besides Badila and D. 1135, Clark's Seedling and Malagache are making a good showing, although, on some of the older farms, a good deal of mottling is present in the H.Q. 426. This may be due to a variety of causes, but still, when next the farmers are planting they should endeavour to select cane that has a healthy leaf, and where stem is free from cracks and small roots.

"The careful selection and continuous changing of plants is a matter all farmers ought to concentrate on. It will pay them handsomely.

"A considerable amount of liming is being done on the Gordonvale farms. This is a good feature. More green manuring could also be gone on with, especially on some of the higher lands. Blood and bone manure is being used as a fertilizer by numbers of the farmers, with good result. Patches of poor soil are evident at intervals on some of the plantations, but it is likely these are due to lack of drainage and a consequent souring of the affected patches. The draining and livening of such as these, and the planting of a quickly growing cane with a good root system, such as Q. 813, would perhaps help the farmer over the difficulty. Otherwise an analysis would determine for him the artificial manures he would require to bring it up to standard.

"The cultivation done by farmers is of good standard, although some growers could be more careful in working the young plant crop. The best implement is one that creates a good tilth, but has no tendency to invert the soil particles or displace the young roots. The 'Bottom King' is a useful implement for a farmer to possess, also the 'King cultivator.' Mechanical traction is coming into vogue a good deal in all the Northern districts, being a considerable saving in horse flesh to the farmer.

"HAMBLEDON.

"Milling operations were still in progress at Hambledon, and a number of the growers had fair quantities of cane to get in. The farmers right through have had a very satisfactory run and expect a still larger crushing next season. As the seasons progress, more scientific farming is being gone in for in the way of studying fertilizers; the most efficient farming machinery, and soil conditions generally are

being given careful consideration by the growers. A considerable amount of liming and green manuring has been done in the last twelve months, and in addition to this great activity is at present noticeable in connection with the combating of the grub pest. Arsenic is being used freely, in some cases up to as high as 200 lb. weight to the acre. Growers, however, ought not to take the treatment of some of the badly-infested Cairns soil as an absolute guide, and for ordinary purposes it is not necessary to apply more than 60 lb. per acre.

''With regard to the behaviour of varieties, Badila is still the most satisfactory from the farmers' point of view.

''Mr. Walker, of Hambledon, has a small quantity of 'Pompey,' recently introduced by the C.S.R. Company, and, judging by its healthy, erect appearance and vigorous stool, it should be a cane worth looking after.

''Clark's Seedling is giving satisfactory returns, but appears to do better on the loams than the volcanic soils, ratooning poorly on the latter. This cane, if not carefully selected, will probably become very poor in a few years, owing to its susceptibility to attack by disease through the medium of the leaves. Good selection and rotation of crops will go a long way towards keeping this cane up to standard.

''After a crop that has been diseased is taken off, sometimes the bacteria that was the cause of this disease remains in the soil. That is why it is a good idea to fallow after a poor crop, if disease has been the cause of the poverty, or plant some immune crop, such as cowpea or Mauritius bean. D. 1135 is still being planted in considerable quantities, and being a highly-resistant cane to ordinary parasitic attack, is a useful variety to plant on grub and borer-infested areas.

''BUNDABERG (Woongarra and Barolin).

''Since last visiting these areas splendid rains have fallen, and the plant crop looks well. Many of the farmers are busy ploughing, preparatory to an early start at the planting, while a considerable amount of labour is being employed in the field keeping down the weed growth. The chances for next year are very good, provided an ordinary amount of rain falls. The borer is not quite so numerous as three months ago, although there will probably be another outbreak about next May. It is likely the moths are now flying, although none have been observed. This is difficult, seeing that they mostly move at night and bide in the foliage during the day time. The farmers on these areas are doing more green manuring than hitherto. This is a good feature, especially in view of the fact that grubs are numerous in places, and the more vegetable matter in the soil, when these parasites are present, the better.

''With regard to varieties, Badila, 1900, H.Q. 426, and D. 1135 are making good headway. A variety known as Shahjahanpur recently distributed from the station has made good headway, and some grown by Mr. McCrackin, of Rubyana, has outstripped in growth all the other canes. This variety is a vigorous striker, with a good root system, stools well, and grows in an erect manner. It has a good sugar content and is highly resistant to frosts. From a farmer's point of view, the little of this variety they have is worth keeping and replanting.

''The weather has been hot here this last week, baking the soil and making it unpleasant for the men to work, as many go barefooted while hoeing. Boots are very unsuitable for working in a red volcanic soil, and the evolution of a suitable foot-covering for farm labourers would be a boon in the hot weather. A fair amount of mechanical traction is in evidence, more especially the 'Caterpillar' type.

''The farmers are at present well supplied with water and grass, and live stock and leguminous crops look well.''

COPRA DRYING.

As is generally known, the object of copra-drying is to get rid of the water from the coconut, or, at least, as much of it as will prevent the formation of mould and the consequent deterioration and loss of oil.

When the lighter parts of the oil are lost, the remainder is of inferior quality, oleac acid is formed, and the oil becomes rancid.

Mr. W. E. Shoobridge, chairman of the Saaz Patent Drying Process Co. Ltd., of Hobart, Tasmania, who passed through Port Moresby on the Morinda to Samarai, and who will be returning by that vessel, claims that his company's process fulfils perfectly the conditions of drying copra at a low temperature under perfect control,

to a degree, and, therefore, can be adjusted to the exact temperature to evaporate moisture, and not to volatise the oil, leaving the copra so dry and cool that it will not absorb moisture and therefore will maintain its quality and quantity. Mr. Shoobridge carries samples of copra in his pocket which he says were dried by his process six years ago. They are of a pure white colour, are of good odour, and certainly impress one as being more appetising than some of the samples we have seen arriving in Port.

Briefly, the Saaz process consists in passing the air over steam pipes and then being driven through the machine by a blast fan, and, where necessary, in hot damp air, to be passed first over brine pipes to condense some of the moisture before being heated by the steam pipes. The copra is laid out on broad bands of wire netting, passing round rollers, and driven by link belt chains. Several floors can be placed one over the other. There are five floors, each section containing 3,000 superficial feet of drying surface.

For handling it is proposed that the nuts should first be cut clean in halves by a thin circular saw, the halves passed under a jet of water to wash them clean, then placed on an elevator and taken up to the floors and placed face down. In about eight hours the nuts are sufficiently dried to leave the shell and can be easily taken out, and the five floors placed on the lower one and the four top floors be reloaded. It is estimated that from 2 to 2½ tons of copra can be dried in each section in each twenty-four hours. An analysis of the copra dried under this process showed moisture 5.30, oil 67.10, and oleac acid .263. The copra was dry and would not show an oil-mark when pressed on absorbent paper, but when raised to a temperature of 104 deg. F., showed a distinct oil-mark and at 180 deg. the oil was running freely from it. On being exposed to damp air for a week it had rather lost than gained moisture. No oil was lost in the drying, and it retained its full flavour.—"Papuan Courier."

Forestry.

DESTROYING THE BITTER BARK TREE.

In reply to an inquiry as to the eradication of bitter bark, by Mr. B. Henicke, of Mount Larcom, the Government Botanist (Mr. C. T. White) has replied as follows:—

Bitter bark (*Alstonia constricta*), which suckers so freely, might be poisoned with an arsenical solution like other standing timber.

Standing trees might be "frilled" by making a succession of downward axe cuts right round the tree into the sapwood and each cut overlapping the other so as to leave no unsevered bark or sapwood for the conveyance of food-containing sap for the tree. The solution should now be freely poured into the frill with a watering-can (without a rose) or old teapot or kettle.

Bitter bark suckers freely, and the eradication of sucker growths in paddocks or cultivation areas is more difficult; the suckers might be cut down, however, and a solution painted over the cut stump with a brush or swab. They also, of course, can be grubbed out, and constant grubbing will exhaust the old roots eventually; an arsenical solution poured round the grubbed plant would no doubt be effective, but would poison the ground for some time for all other plants.

A suitable solution is—Arsenic, 1 lb.; washing soda, 3 lb. (or caustic soda, 2 lb.); water, 4 gallons. The soda is necessary to help the arsenic dissolve, and Mr. G. B. Burrowes, Assistant Inspector of Agriculture in New South Wales, recommends the addition of whiting, because the whiting dries white and shows which trees or plants have already been treated. If ordinary washing soda is used, boiling will be found necessary to bring about complete solubility, but, if caustic soda, the heat generated does away with the necessity of boiling.

It may be worth mentioning, perhaps, that the bark of *Alstonia constricta* is a useful tonic, and is official in the British Pharmacopœia, but the demand is very limited. A solution has been used, I believe, with some success as a tick wash.

Dairying.

THE INFLUENCE OF BARLEY ON THE MILK SECRETION OF COWS.

Amongst the standard feeds for horses, cattle, sheep, and pigs in the United States of America, barley is much in evidence, and is frequently used as a part of the grain ration for dairy cattle and poultry. Some dairy farmers have a prejudice against the use of this cereal for milch cows, who believe that it has a tendency to dry up the cows, but the nutritive effect of the cereal, and its high value for stockfeeding, are otherwise generally recognised by farmers. As to its influence on the milk secretion of cows in the United States University dairy herd, this has been studied during the past few years, and the results are thus summed up in the following pages by Messrs. F. W. Woll, head of the Animal Husbandry Division of the College of Agriculture, Berkeley, California, and E. C. Voorhies, of the same division:—

EXPERIMENTS WITH GRADE HOLSTEIN.

In taking up this question for study, it was decided to feed barley as the sole concentrate to a good type of a dairy cow for several lactation periods, in addition to alfalfa hay or alfalfa and silage. The plan was to feed barley heavily during this time, up to the limit of the cow's acceptance, so as to secure as conclusive evidence as possible with regard to the cumulative effect of this cereal and this method of feeding on the milk flow. The cow selected for this experiment, a grade Holstein named Hannah, had been in the University dairy herd for a year previous to the trial. She was purchased by the University in July, 1913, was about four years old at that time, and weighed slightly over 1,200 lb. She dropped a bull calf on 16th July, shortly after her arrival in the herd. Hannah is a strong, healthy animal; she has always been in the best of health and condition while in the herd, and has repeatedly been placed on experiments which did not interfere with that here outlined. Her feed record for the year prior to the barley feeding is complete up to 1st January, 1914, so far as kinds of feeds are concerned. Since that time, the amounts of feed eaten are known for her as well as all other cows in the University dairy herd.

The milk yielded by the cow was weighed throughout the lactation period, and weekly composite samples of the milk were taken and tested for total solids and butter-fat. The effect of the grain feeding on the body condition and the general health of the cow was also carefully noted. Table I shows the production and the feed consumed by this cow during five consecutive lactation periods, 1913-18. During the middle three years, 1914-17, she was fed barley as a sole concentrate, and during the first and the last year of the trial mixtures of common grain feeds, the roughage fed throughout the trial being alfalfa hay or green alfalfa, and Indian corn or sorghum silage.

TABLE IA.

PRODUCTION OF HANNAH, 1913-18.

Year	Dates of calving	Days in milk	Lbs. milk	Lbs. butterfat	Per cent butterfat	Ave. body weight lbs.	Character of grain feed
1913-14	July 16, 1913	274	8,246.2	269.11	3.27	1,231	Mixed
1914-15	May 27, 1914	350	12,806.1	432.77	3.37	1,276	Barley
1915-16	June 30, 1915	308	11,859.5	373.11	3.15	1,349	Barley
1916-17	June 14, 1916	323	9,605.4	315.74	3.29	1,439	Barley
1917-18	July 23, 1917	317	9,535.5	325.06	3.41	1,445	Mixed

TABLE IB.

FEED CONSUMPTION BY HANNAH PER LACTATION PERIOD, IN LBS.

Feeds	1913–14*	1914–15	1915–16	1916–17	1917–18	Average 1914–17 (barley only)
Alfalfa hay	..	4,674	4,551	5,482	4,931	..
Alfalfa, green	..	6,836	5,331	2,378	855	..
Indian corn, green	..	317	359	..	195	..
Indian corn, silage	..	1,570	6,537	6,564	8,591	..
Sorghum silage	..	3,437	..	..	1,587	..
Sudan grass silage	..	..	..	650	..	..
Barley	..	3,059	2,917	2,350	483	..
Wheat bran	..	..	..	..	292	..
Oats	..	..	..	..	24	..
Cocoanut meal	..	..	..	..	336	..
Dried beet pulp	..	..	..	..	1,015	..
Cotton seed meal	..	..	..	..	46	..
Total concentrates	..	3,059	2,917	2,350	2,917	2,775
Average daily grain	..	8.7	9.5	7.3	6.9	8.5
Feed units, roughage	..	4,177	4,156	4,283	4,308	4,205
Feed units, concentrates	..	3,059	2,917	2,350	2,197	2,775
Total feed units	..	7,236	7,073	6,633	6,505	6,980

The table shows the dates of freshening during the progress of the experiment; days in milk for each lactation period; production of milk and butter-fat, with average per cent. of fat, body weight, and feed consumed. It will be seen that Hannah's production during the first lactation period on barley was increased by about 4,560 lb. of milk and 164 lb. of butter-fat over that of the preceding period—an increase of 55 per cent. and 61 per cent., for milk and butter-fat respectively. This increase was, of course, primarily due to the heavy grain feeding practised during this year. Up to March, 1914, Hannah received rough feeds only, alfalfa hay and corn silage, to which a daily allowance of 5 lb. of mixed grain feeds (barley, oats, linseed meal, and cocoanut meal) was added after 5th March. During the greater portion of the first year of barley feeding, on the other hand, she received 10 lb. of barley daily, and 7 to 8 lb. during the last four months of the lactation period. While she was offered and ate as much as 15 lb. of barley daily for a few weeks during the following lactation period, it was found that 10 lb. a day was ordinarily her limit, and this amount was rarely exceeded even at the flush of her production when she produced over 2 lb. of butter-fat daily. She remained in milk considerably longer this lactation period than during the preceding year, viz., 350 days, and her body weight was, on the average, 45 lb. heavier during the barley feeding than while on mixed grain the preceding period.

During the following two lactation periods the feeding of barley as exclusive grain feed was continued; the amount of milk produced during these two periods was somewhat lower than during the preceding year, but considerably above the yield for the mixed grain period, and the same holds true also for the production of butter-fat during these periods. If the average production by the cow during the three lactation periods when she was fed barley as sole concentrate be compared with the corresponding averages for the preceding and the following periods when mixed grain was fed, it will be found that her milk production during the barley periods was 2,533 lb., or 28.5 per cent., higher than when she was fed mixed grain, and her average production of butter-fat was increased by 75 lb., or 25.3 per cent. Her lactation periods during 1914-17 were thirty-one days (10 per cent.) longer, on the average, than during the mixed grain feeding, and she weighed an average of 29 lb. heavier during the intermediate periods than when fed mixed grain rations.

The average yields of butter-fat by the cow for each day in milk during the five lactation periods, 1913-18, were .98, 1.23, 1.21, .98, and 1.03 lb., the average for the barley period being 1.14 lb., which is 13 per cent. above the average for the mixed grain period. Since the amount of grain and roughage eaten during the first lactation period, 1913-14, is not known, no definite comparison can be made between the feed consumption and the dairy production of the cow during the five-year period. However, as grain was fed only during the latter part of the first lactation period,

* Amounts of feed eaten known only during latter half of lactation period; fed alfalfa (green or hay), corn silage and concentrates (barley, oats, bran, linseed meal, cocoanut meal, in varying mixtures) during the year.

the amount of mixed grain eaten, and the total or daily feed consumption must have been considerably lower this period than during the first year of barley feeding. The average amount of barley eaten daily for the period 1914-17 was 8.5 lb., against 6.9 lb. of mixed grain the following year. The average number of feed units in the barley rations was 6,980, or 7.3 per cent. above that furnished in the last mixed grain period, 1917-18. It seems evident, therefore, that the increase in production during the barley periods, as compared with the yields on mixed grain feeding, came largely as a result of the heavier rations fed, especially of grain, during the barley periods.

There is nothing in the results obtained on the experiment with this cow that would indicate that an exclusive or even a heavy, long-continued feeding of barley has any deleterious influence on the milk secretion of the cow; on the contrary, the production was greatly increased on barley feeding; her lactation periods were about a month longer, on the average; she weighed heavier when fed barley than when receiving mixed-grain rations, and she was in perfect health and maintained an excellent appetite throughout the whole feeding period. The effect of the exclusive barley feeding was therefore beneficial in every respect.

* The explanation of the belief of some farmers that the feeding of barley tends to dry up milch cows is probably to be sought in the fact that such a result has frequently come when cows have been turned out on barley stubble, or fed coarse barley hay only, with no additional feed. The amount of feed they are thus able to obtain, especially on stubble pasture, is not, as a rule, likely to furnish sufficient nutriment for the maintenance of a fair dairy production, and a decrease in the milk flow naturally results, along with a gradual drying up of the cows. The barley is blamed, while it is the system of feeding that is responsible for the result observed. Milch cows producing a good mess of milk cannot be expected to pick up sufficient feed to maintain their production on barley stubble alone, but fed alfalfa hay in addition, or better still, alfalfa and some succulent feed, like silage or roots, they will give good returns for the feed that they find in the stubble field.

In view of the results and discussions presented in the preceding, there is every reason to utilise barley for feeding dairy cows when it is not needed for human food and whenever its price is not too high in comparison with other concentrates to make it an economical stock feed.

PAPER FROM BAGASSE.

A FORMOSAN ENTERPRISE.

In Formosa they have succeeded in establishing a successful paper-making industry, with bagasse as the raw material.

In 1915 they turned their attention to the utilisation of bagasse, which up to that time was exclusively used for fuel, as a material for paper, and having been convinced of the promising future of the bagasse paper industry as well as the many advantages of a process operated as a subsidiary industry of sugar manufacturing, they carried the scheme into execution, investing a considerable amount of capital in it.

Regarding the encouraging prospects which this industry had in store, there is no room for the slightest doubt. In Java and in America, also, interested parties are making extensive studies of the subject. For example, Messrs. Fluto & Co., of New York, some time ago created a special department in their office for its study, and are now making various investigations in conjunction with many problems relative to sugar-making.

In conclusion, it may be of interest to add that well-made bagasse paper possesses several valuable qualities. It is far more durable and more nearly water and moisture proof than papers made from other materials. The results of the scientific and practical tests conducted clearly show that the bagasse paper proved twice as moisture-proof without the application of any treatment for this purpose as ordinary wrapping paper made in Japan proper. These admirable characteristics of bagasse paper are natural qualities, and when advantageously employed will greatly extend its uses beyond wrapping and printing purposes.—"The South African Sugar Journal."

* It is believed by some farmers that feeding smutty barley will tend to dry up milch cows. There is, however, no definite evidence to this effect, although the danger of feeding considerable amounts of smutty grain to any kind of stock, and especially to pregnant females, is generally recognised.

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Station has received the following report upon Cane Grub Investigations, from the Entomologist, Dr. J. F. Illingworth:—

Splendid rains have fallen during the past month, and conditions could not be better for crops. Naturally, the days are somewhat oppressive in summer in this humid climate, but it is just what the cane requires; one can fairly see it grow. If we escape a cyclone, there is every promise that the cut next season will be a top-notcher.

Cane beetles began emerging on 18th November here, yet I am pleased to report that they have not appeared in excessive numbers. Fortunately, the Muscardine fungus and other natural agencies destroyed the vast majority of the grubs on the Greenhills Estate last season; hence there is a marked decrease in the number of beetles that came out, particularly in the fields that have been regularly infested.

Considerable attention has been given, during the past month, to a study of the biology of cane beetles in general, particularly their mating habits, egg-laying, &c. As is probably well known, the grey-backs are only one, though the most serious, of the numerous species of beetles that deposit their eggs in cane land. Hence, our investigation naturally covers all important pests of sugar-cane.

EMERGENCE OF CANE BEETLES IN THE CAIRNS DISTRICT.

It was about five days after the soaking rains beginning on 12th November that we found the first grey-backs on the feeding trees. Yet the height of the flight was not reached until about the end of the month, following the heavy downpour of 25th-27th November. *Lepidiota frenchi* began to appear immediately following the latter rain at Gordonvale, and by 10th December this species was out in considerable numbers, especially in the areas where they were troublesome last season. As is well known, this species has a two-years' life cycle, and the heavy emergences of the beetles occur in the even years—1916, 1918, 1920. *Lepidiota rothei* emerged somewhat later, for I found the first specimens mating on low bushes at dusk on the evening of 13th December.

On the other hand, *Anomala australasiae* and *Anoplognathus boisduvali* emerged in considerable numbers, following the first rains. The *Anomala* is rather peculiar in its habit of feeding on the flowers of the lantana. The fragrance which these beetles often give off is probably due to the nectar that they absorb from the flowers. The Christmas beetle (*A. boisduvali*) is very partial to blue and poplar gums; it is seldom that one finds them on other feeding trees.

The grey-backs usually go to the Moreton Bay ash, wattles, figs, bloodwood, blue gum, and even the new growth of the ti-tree and apple (*Careya*). We have made the interesting discovery that it is the custom of these beetles to feed for a brief period—a day or so—on the cane leaves, before flying away to other feeding grounds. Banana plants in the cane areas are also invariably considerably eaten.

BEETLE EMERGENCE HEAVY AT MOSSMAN.

This was once a region seriously devastated by beetles, but fortunately during the last decade the district has suffered little from these pests. Recent reports, however, state that the beetles have appeared in great numbers, which is not encouraging, yet I hope they will confine their activities to the uncultivated areas.

MATING HABITS OF *LEPIDIOTA ALBOHIRTA*.

Heretofore, we have had no definite knowledge of the mating habits of this species, due largely to the fact that the beetles favour large, tall trees, hence are too far up for easy observation. The mating activities of *L. frenchi* and *L. rothei*, on the other hand, are easily observed, for when they emerge at dusk they fly to low bushes, and even copulate while hanging on wire fences or any other available objects. The males in these species invariably slide backwards and hang head downwards, as soon as connection is secured; here they hang perfectly motionless and rigid for about half an hour, when they separate and begin feeding.

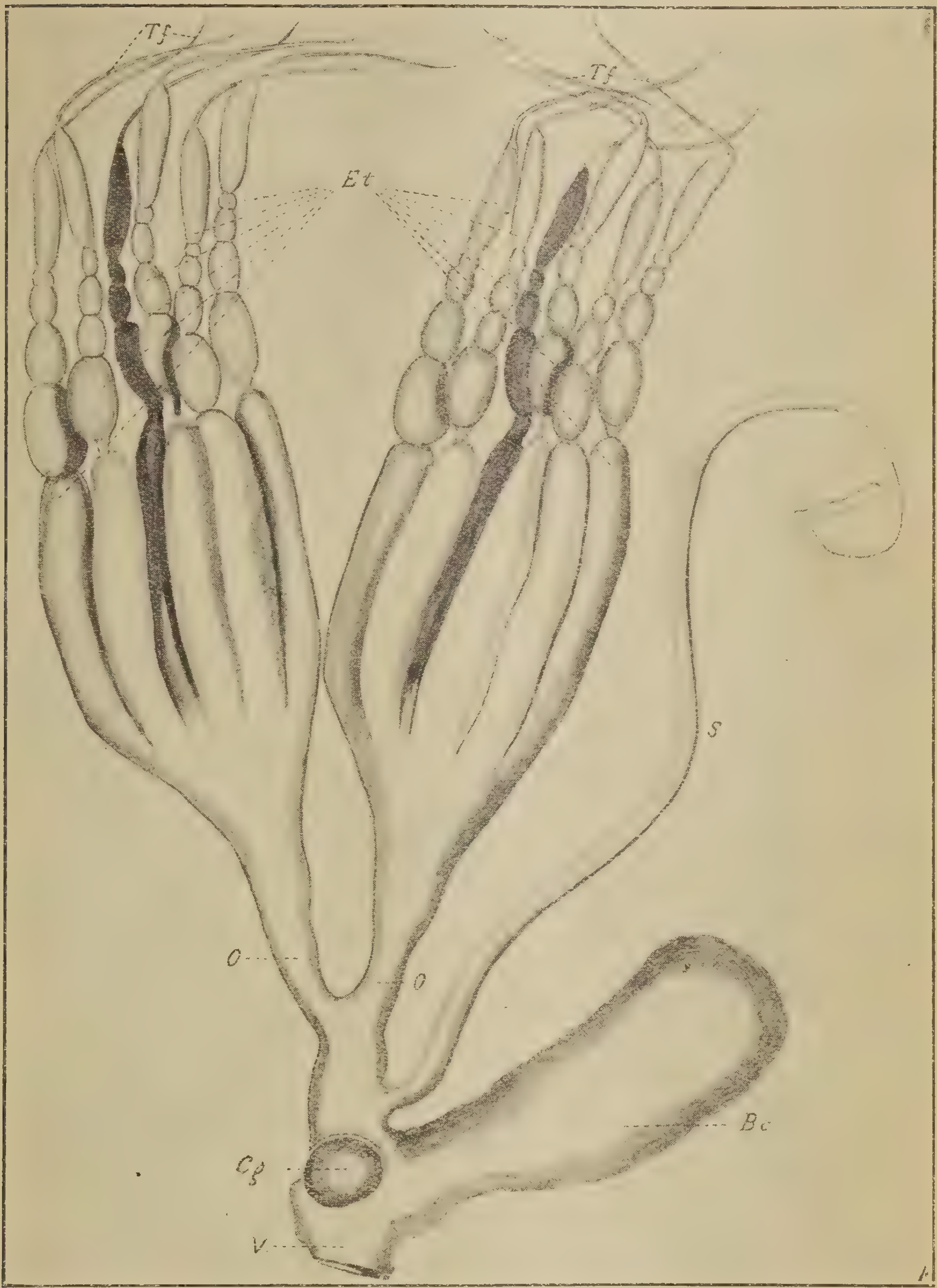

PLATE 9.—(FIG. 1) REPRODUCTIVE ORGANS OF FEMALE (*Lepidiota albohirta*) WATERHOUSE, X 5.

(Taken from beetle 3 days after emerging.)

Bc. Bursa copulatrix. *Cg.* Cement gland. *Et.* Egg tubes. *O.* Oviduct. *S.* Spermatheca *Tf.* Terminal filaments. *V.* Vagina.

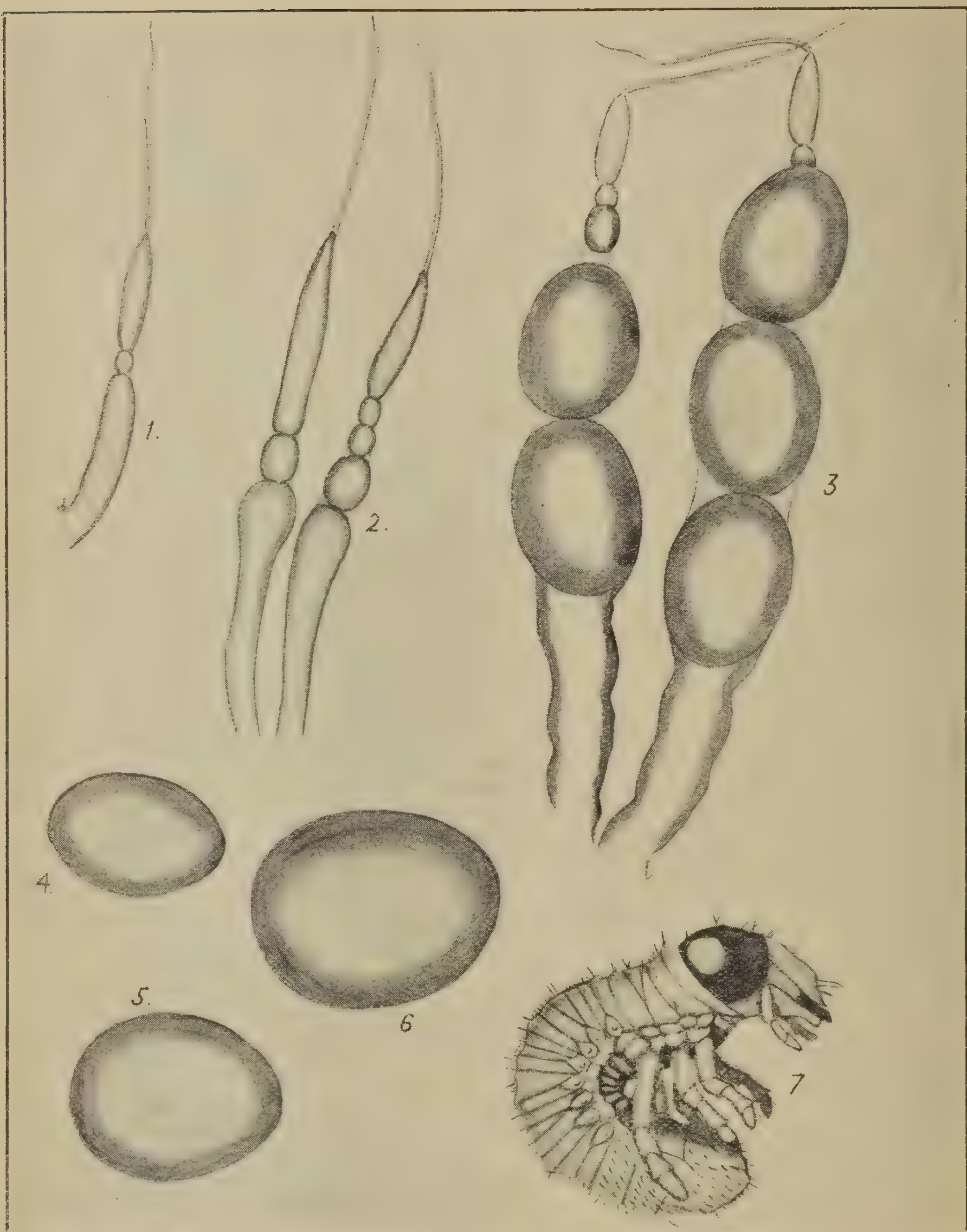

PLATE 10.—(FIG. 2) STAGES IN DEVELOPMENT OF *Lepidiota albohirta*, WATERHOUSE.

1. Egg tube from beetle before emerging.
2. Egg tubes from beetle shortly after emerging.
3. Egg tubes from beetle a fortnight after emerging, when ready to oviposit.
4. Newly-laid egg.
5. Egg taken from soil one week after laying.
6. Egg taken from soil two weeks after laying; ready to hatch.
7. Newly-hatched grub.

(All drawings magnified 5 diameters.)

This year we were fortunate in finding grey-backs on low trees near the laboratory, and observations between 7 and 8 p.m. disclosed that their mating habits did not differ materially from the other species of *Lepidiota*. It is interesting, however, to record that we have now demonstrated that all of these beetles copulate repeatedly during the period that the eggs are developing; I have even taken mating pairs when the abdomen of the female was packed full of ripe eggs, ready to oviposit. Furthermore, the males go from one female to another, as I have repeatedly observed. I have also made similar observations on the polygamous habits of the other species of *Lepidiota*.

FEEDING HABITS OF *LEPIDIOTA FRENCHI*.

This species, unlike the grey-back, apparently feeds very little during the period that the eggs are developing. Dissections of copulating beetles invariably showed the intestines empty, even when the eggs were almost fully developed. This is in marked contrast to the grey-backs, which are always packed full, from end to end, during the whole period that they are on the wing.

The fact that *frenchi* is able to develop eggs with very little, or possibly even no food, helps to explain their damage to cane far removed from any possible feeding trees. In such cases, when the beetles emerge in great numbers, they hang up on the wire fences to copulate, and are so numerous that one could gather them by the bucket-full. Here they have no opportunity to feed, and apparently go back into the ground, emerging on successive evenings to copulate, until the eggs are ready to lay. Where feeding trees were available, we have found these beetles on Moreton Bay ash, bloodwood, blue gum, and guava; but in no case was there much evidence of feeding. Then, too, when we confined the beetles in cages, they scarcely touched the leaves provided fresh each day. Furthermore, beetles placed in cages with no food oviposited as usual. The adults are able to endure this period of starvation because the grubs store up greater quantities of fat, before hibernating, than is the case with the grey-backs.

GRUB PARASITES ABUNDANT AT GREENHILLS.

As I have mentioned in former reports, the males of the *Campsomeris* wasps continue abundant, flying over the surface of the soil of the infested areas. Since we found that the males and females were in about equal numbers, when we were breeding these useful insects, we naturally conclude that every male above ground has a mate below—searching out the grubs. This is certainly encouraging; though no grey-back grubs are available at this season, there are several other destructive species, *i.e.*, those having a two years' life cycle. These will tide the wasps over until the *albohirta* grubs develop for a month or so; then the wasps will probably have all that they can do.

DESTRUCTION OF FEEDING TREES.

In the area that we cleared last year, bordering the fields on the Greenhills Estate, many suckers had grown up; to save brushing these off, I was fortunate in being able to destroy the foliage by a grassfire soon after the beetles emerged. Undoubtedly by this method some of the beetles were consumed, and it certainly is the most rapid and easy method of ridding the area of leaves on which the beetles might feed. I was pleased to see that another grub-infested area near Gordonvale has been treated in the same way very effectively. It certainly saves a tremendous amount of labour, which would be required to brush over areas that had been previously cut.

BEETLE BORER PARASITES.

Recent observations at Babinda have extended materially the known area where these friendly insects are active; undoubtedly they will soon extend to every portion of that district.

In casting about for an explanation of the remarkable success of these Tachinids at Babinda, when they have apparently failed to become permanently established in other centres, even where far greater numbers of the flies were liberated, I have come to the conclusion that the Babinda success is due solely to the fact that standover cane was available for the flies to breed in during the season that the fields were normally bare. These flies have a life cycle of about five weeks, so if they can find no borers in standing cane for that length of time, they must naturally die out. The exigencies of the case at Babinda make it impossible to harvest all of the crop, so there are inevitably a few fields throughout the district that must stand over uncut. This condition has proved a blessing in disguise, for it has been worth fully £25,000 to the district the past season, in the reduction in borer injury. Let me urge then that some small areas throughout the district here and there be left until such time that the ratoons begin to make cane again. In this way I am satisfied that the parasites will remain permanently established in spite of their natural enemies, for

their rate of multiplication is tremendous—each female being capable of producing 500 or more during her life; and with a life cycle of only five weeks, one can easily estimate by geometrical ratio that the results would be so enormous that in a year they would be unthinkable. I am now satisfied that this is the main factor in maintaining the parasites permanently in any district, and it should be observed especially at the time that the first flies are liberated.

At Mossman, where the flies became so well established, they were at first liberated in the mill nursery, where much of the cane stood over during the period that other cane was cut. From this centre they have gradually become distributed in plants to every part of the district. Now that they are established they find sufficient standover cane to pass successfully the trying period when cane is usually milled.

LINEAR BUGS (*PHÆNACANTHA AUSTRALICA*).

I have called attention to the relation of these bugs to diseases of various sorts on cane leaves, but a most remarkable instance of this came to my notice on a Mulgrave River farm recently. Old ratoon cane, which was swarming with these bugs, was burned preparatory to cutting, hence many of the insects were driven across the headland into a field of young plant cane; they only extended into this about ten rows from the headland, but the leaves soon became badly blighted with tip wither, a disease which begins at the margins of the leaf and gradually extends downward; the affected portions of the blade dry up and leave a brown demarcation separating it sharply from the green midrib, which succumbs more slowly, dying backward from the tip. It was very evident that the bugs were the direct cause of this trouble, for the disease was worst in the portion of the field where the bugs were most numerous, and none of the leaves showed any trace of the disease further back in the field where there were no bugs.

THE VALUE OF SCIENTIFIC RESEARCH.

(*Extracted from Report No. 2 of the State Advisory Council of Science and Industry of South Australia.*)

THE WHEAT PESTS PROBLEM.

It is now well recognised that scientific research is of great money value, but it is not often that successful practical results follow so quickly upon research as in the recent campaign against the insect pests in the vast quantities of wheat which, owing to the war, accumulated in Australia. In this campaign South Australia played a very important part.

In the early stages of the weevil plague, at the instance of Mr. G. G. Nicholls, manager of the South Australian Wheat Scheme, a Wheat Weevil Committee was appointed, consisting of Dr. W. A. Hargreaves, Director of the South Australian Department of Chemistry (chairman), Mr. G. G. Nicholls, Mr. W. J. Spafford (Superintendent of Experimental Work, Department of Agriculture), Mr. A. M. Lea (entomologist to the S.A. Museum), Mr. E. A. Badcock (manager, S.A. Farmers' Co-operative Union, Limited), and Mr. J. T. Jackett (miller). Subsequently Mr. D. C. Winterbottom (Supervisor of Weevil Department in S.A. Wheat Scheme) was added to the committee.

The work of scientific research on the subject was taken up by the Department of Chemistry, and from experiments conducted in the laboratory of that department three practical systems of treatment were devised. These, when put into use by the Wheat Boards in the States of South Australia, Victoria, and Western Australia, resulted in saving wheat worth at least £1,500,000, besides giving very valuable knowledge on the whole problem of stored wheat which will be of service in the future.

This estimate of monetary value is an approximation. It is, however, based on the observation that the actual weevil damage was at least reduced to one-half of what it would otherwise have been. Senator Russell, chairman of the Australian Wheat Board, announced on 10th January of this year that the actual weevil damage done to the wheat purchased by the British Government during the time it was held after purchase and before shipment had been assessed at 2,200,000 bushels, and that the British Government had agreed to pay the Australian Wheat Board the sum of £522,000 to cover this loss. This was based on the contract rate of 4s. 9d. per bushel. The amount paid for losses can be taken as a low estimate of the value of the wheat saved for the British Government. During the three years 1915-16, 1916-17,

1917-18 the Commonwealth production of wheat was 404,000,000 bushels, of which South Australia contributed 98,000,000 and Victoria 136,000,000 bushels. The British Government contract was for 112,000,000 bushels, of which South Australia supplied 36,000,000 and Victoria 40,000,000 bushels, so that in round figures the British Government took about one-quarter of the Commonwealth output, and this entailed about one-third of the output of South Australia and Victoria. The savings to each of the States of South Australia and Victoria can be taken, then, to be at least an equal amount to that saved for the British Government. Hence, we arrive at the conservative estimate of £1,500,000 worth of wheat saved from destruction as the result of scientific research.

The following figures may help to demonstrate the extent of the undertaking as it affected South Australia, where the wheat had to be safeguarded from mice, weevils, &c.:—

The crop carried over from 1917-18 and in stacks was 42,000,000 bushels. The 1918 crop was 26,000,000 bushels, making a total of 68,000,000 bushels on hand. During the twelve months following only about 11,000,000 bushels were disposed of, leaving nearly 57,000,000 bushels to be carried over to 1918-19. The 1919 crop was over 20,000,000 bushels, and left no less than 77,000,000 bushels to be guarded.

Some idea of the magnitude of the work can also be gained from the following remarks made by Mr. B. A. Love, who was the Australian Commissioner for the Royal Commission of Food Supplies in London:—

"The cleaning, sterilising, and handling that had to be undertaken in Australia in connection with the wheat was without doubt the largest campaign of its sort that the world has ever had to undertake. When one considers the enormous amount of labour and the handling involved to enable the vast quantities to be cleaned, sterilised, and made fit for shipment it was truly colossal. In looking back over the work, I think we can be proud of the results of our labours. It is nice to feel, considering the enormous amount of thought and worry put into the task, that it was successful in results, efficiency, and cost. The gassing campaign without doubt saved an enormous amount of money, and enabled vast quantities of wheat to be held over until they could be treated."

The methods recommended by the Wheat Weevil Committee as the result of the scientific research carried out by the Department of Chemistry were the following:—

1. *Cleanliness.*—The weevil was recognised as a pest which was fostered by careless and dirty conditions. Cleanliness in the collection, transport, and storage of the wheat was, therefore, advocated. In storage the chief problem was to prevent contamination of the stacks from without. Hence the following precautions were enjoined:—Absolutely clean stacking sites, impervious insect-proof floors, thorough cleaning up of old stacking sites, and gutters filled with water, oil, or molasses placed around the base of the stacks to prevent access of crawling weevils. Stacks were either enclosed in hessian and then limewashed, or, wherever practicable, entirely enclosed in malthoid sheds. The malthoid sheds, first tried at the suggestion of Mr. A. M. Lea, a member of the Wheat Weevil Committee, proved the most successful.

2. *Gas Treatment.*—The use of poison gas for the extermination of vermin is by no means a new idea, and as far back as 1890, gas plants were used in South Australia for the purpose of suffocating rabbits in their burrows by means of air deprived of its free oxygen by being passed through a fire. During the mouse plague of 1916-17, Dr. Hargreaves had suggested the use of a gas-producer plant for providing large quantities of cheap gas for the extermination of mice; and in the middle of 1917, Mr. Saunders, of Clutterbuck Bros., of Adelaide, experimented with producer gas as a means of destroying weevils; but these initial experiments were unsatisfactory, because the treatment was not continued nearly long enough. Carbon dioxide compressed in cylinders had been advocated in 1898 by Noel Paton, and in 1911, 1912, and 1913 by Barnes and Grove, but their methods were prohibitive on account of cost. It was not until the time factor was shown to be an important one, by experiments with weevils in closed bottles, carried out in January, 1918, by Mr. Spafford, a member of the committee, that gas treatment was found effective.

Mr. D. C. Winterbottom, Chemist in the Department of Chemistry, was transferred to the South Australian Wheat Scheme as officer supervising weevil destruction, and he installed the first gas plant in Australia. It was a decided success. Subsequently other plants were installed by him in South Australia and Victoria, and similar plants were used in Western Australia. The operation of these gas plants in South Australia was placed in the hands of Messrs. S. D. Shield and E. A. Pengelly, research chemists of the Department of Chemistry, and in Victoria the plants were in charge of Mr. P. J. Thompson, of the Melbourne University.

The method employed was as follows:—The stacked grain was entirely enclosed in sheds covered with malthoid or similar material made as nearly air tight as possible. Then air freed from free oxygen by being passed through a furnace similar to that of a gas producer, but producing carbon dioxide instead of carbon monoxide, was blown into the shed for three or four weeks to asphyxiate the insects. Many large stacks were thus successfully treated. In one case the stack contained 200,000 bags of wheat.

3. *Heat Treatment.*—In the cleaning and shipment of the weevilly wheat, heat treatment to a temperature of 140 degrees or 150 degrees Fahrenheit was found to be the most effective method of checking further outbreak of weevil. Soon after research was commenced in August, 1917, Mr. Winterbottom found that this would probably be a successful method, and experiments were made to see the effects of heat treatment on the wheat. It was proved that the flour and bread making properties were not impaired. A machine was invented in the Department of Chemistry and erected at Port Adelaide, which killed all the insects passed through it without damaging the wheat. This was the first successful heat treatment plant in Australia.

Professor Lefroy was working on behalf of the British Commission in Sydney, and he investigated a large number of devices for destroying weevils, including a number of heat treatment machines designed by different inventors. He finally adopted the Poole and Steele machine. At first this machine was not successful, but Dr. Hargreaves was able, as a result of experience gained by the research experiments, to suggest at a conference in Sydney in March, 1918, certain modifications which resulted in the successful working of the machine, which was then adopted by the British Commission.

The effects of this successful end to the investigations will be more far-reaching than they appear at first sight. Not only can the saving of the wheat stored during the war, which would otherwise have been destroyed by insect pests, be directly credited to scientific research, but the results obtained have demonstrated the practical value of the methods used. These methods can be used in future, so that the total money value of the research is beyond assessment.

HOW SUGAR AIDS LONGEVITY.

"It is not always possible," says a correspondent in our contemporary, "The Confectioners' Union," "to follow scientists in their alleged discoveries of wonderful things in these days to practical conclusion. Recently we alluded to a scientist who claims to have invented a food for hens enabling them to lay eggs that will be self-preserving. In connection, however, with sugar generally, we note that Professor Metchnikoff has been discoursing on a discovery of his that certainly ought to give a great boom to the consumption of confectionery. Stripped of technicalities, this discovery means simply that senility in human beings is the result of certain poisons set up by bacteria, and the effect of these is to injure the liver, brain, and especially the arteries. Now it is contended that none of these poisons can be produced by any kind of sugar, and by the use of large quantities of sugar we understand that life can be very greatly prolonged, other things, of course, being equal. The sugar, it is declared, feeds the healthy bacteria and enables them to destroy those that are deadly.

"We remember that some years ago at Salzburg there was a grand conclave of savants on food science, and thereat it was laid down as an ascertained fact that sugar formed the best of all heart foods. It was demonstrated that it gave strength and steadiness to that organ and staved off disease. All along it has been well known, although not often cited so, that the great dietetic value of sugar lies not in its force-giving properties alone, but also in its most valuable antiseptic virtues. It is not so very long since sugar was regarded to a great extent as simply a nice heat-giver, but inquiries of a close analytical character have at last demonstrated that sugar is very much more than that, and that is why army rations of sugar have been very largely increased. Sugar, in a word, has been pronounced a veritable food; and it really is a preservative to the tissues of the consumers, helping to purify the whole system. Decidedly, it adds to natural force, a thing important in these days of strenuous life, and it helps to keep the heart in thorough working order as probably nothing else can do. Now we are assured that it arrests old age —a thing we can quite understand."—"The Indian Scientific Agriculturist," Nov., 1920. (4 Rupees per annum.)

Science.

EMANALOGY.

BY ARTHUR MORRY, Architect-Surveyor to the Department of Agriculture and Stock.

What is Emanalogy?* The word cannot be found in any standard dictionary, nor is it in daily use. It is a word coined by the writer to express a new development of what is believed to be an old science, based on the fact that every object in Nature, whether animate or inanimate, sends out emanations which are attracted through the machine, human or otherwise, fitted to respond, just as wireless messages are despatched and received.

Some things known to the ancients have been lost to us, such as the glass of Venice, the rust-proof metal of India, and other things might be mentioned as some of the lost Arts. We still wonder how the pyramids of Egypt and the druid columns of Stonehenge were erected. In the Arts and Iudustries, family secrets have been passed on until in time a break has occurred and the secret has been lost. There is reason to believe that the ancients knew something of and practised what we now call the science of Emanalogy; but, whether they understood the natural laws which governed it is a matter for speculation, though there is some evidence in favour of that view, or whether they simply practised it as many do to-day on discovering that they possessed a faculty which some others did not possess, and which they were able to put to some practical use. Jacob appeared to know something about its laws, when he placed the striped rods in the drinking troughs of the cattle, for he expected that the emanations from those rods were likely to produce the effect he desired. At a later date it was looked upon as a great mystery, and was attributed to supernatural agencies coupled with psychology and psychometry, and those known to possess the faculty were ostracised and made to suffer severe penalties. It took Galileo a long time to convince the philosophers of his day that the earth really did revolve round the sun, and so, in this enlightened age, there are scientists and philosophers who refuse to believe that some of the everyday occurrences of our lives—such as those produced by the use of the divining rod—are governed by laws which can be explained by the physical sciences.

The use of what is called the divining rod (for want of a better name) in the search for water and minerals is regarded by some as quackery and charlatanism, because those who use it say they cannot give any explanation of the phenomena, and because, too, they are often lacking in even an elementary knowledge of science. Why, it is asked, cannot anyone take hold of a forked twig and produce results? Why are some people supposed to possess this faculty and not others? May it not be asked, in reply, why it is that some people are superior to others mentally and physically in every sphere of life? In the same way is it not possible for some to be naturally endowed with a greater magnetic force than others? Very delicate experiments in the various branches of physical science have shown that all bodies, animate or inanimate, are susceptible of magnetism and send out magnetic emanations, which are attracted at distance limits not yet determined.

The several forms of electricity, terrestrial magnetism, and electro-magnetism probably all contribute in some way to the production of these phenomena, by discharging emanations the intensity of which is governed by laws known to physical scientists. The human body in some cases constitutes a magnetic machine which responds to the attractive force of magnetic emanations with which it is in contact. "It is possible to discover the law of magnetic intensity by comparing the vibrations accomplished by the same needle during the same time at different distances from the magnet, because, like every known force which emanates from a centre, this law is not affected by the intervention of any substance between the magnet and the needle unless that substance is itself subject to magnetism." Thus it is that in using the forked instrument of wood or metal for the detection of any substance, fluid or solid, it will continue to dip in response to the attractive force of the emanations, notwithstanding the intervention of other substances, until the positive intensity is exhausted, when it stops, but on being brought in contact again with the magnet it actively responds to the negative force until exhausted. By the use of suitable agents it is possible to detect emanations from great depths or from long distances on the surface, notwithstanding the fact that similar substances intervene.

* Emanalogy is a scientific word meaning emanation; that is, the act of flowing forth from a fountain head or origin, from any source, substance, or body, as effluvium, efflex, &c.—Ed. Q.A.J.

For example, several streams or beds of fresh or salt water may be located, one below the other, at great depths, and the thickness of the beds determined, also the nature or character of the matrix containing the water. Several beds of sandstone, shale, or other minerals may be detected in proper sequence, and their thickness and approximate composition ascertained. A dolomitic limestone can be detected and qualitatively analysed, though it be hidden from view hundreds of feet below the surface. The same with basalt or any other rock—not only its distance from the surface, but its component elements can be ascertained.

A glass of water may be drawn from the town supply and distinguished quite easily from another, drawn from a rainwater tank. The height of the reservoir where the former is stored, and a qualitative analysis of its mineral contents may be also determined. Any object may be hidden from view in any accessible place, and its position discovered; depths of soil may be measured; the drainage of swamps facilitated; in fact, there is hardly any limit to the uses to which it can be put.

There are several instruments in use for detecting the presence of water or minerals, but none so far will accomplish any of the above. A co-worker in this interesting work has constructed an instrument, rather crude at present, but which proves the theory of magnetic emanations, and with further improvements will no doubt become a very useful instrument to geologists and others engaged in research work, for by an extension of the same it is possible for wonderful results to be achieved, even by persons devoid of magnetic force.

It can hardly be believed that the means only recently discovered of accomplishing the above are of a simple character, free from complications, though it necessarily requires great concentration during the operation, or mistakes will occur; nor is it claimed that absolute accuracy can be secured as yet, in the absence of scientifically constructed instruments, but before long it will be quite possible—indeed it may almost be said to be so now—for an emanalogical survey of any area to be made, showing the position, width, depth, and direction of all underground streams, fresh and salt, and for the nature of the rocks below the surface to be stated, even some thousands of feet in depth. These are most important matters, and naturally will not be accepted by many, but the writer's experiments, more especially those of recent date, are based on known scientific laws which he has learned to apply during a long professional career, and which gives him the courage to express his convictions in the face of criticism and ridicule.

The science of geology has wonderful fascinations which could be made even more attractive if combined with the study of emanalogy.

RAISING RHUBARB FROM SEED.

Rhubarb has a large appetite, and wants planting in soil that has been well worked and heavily manured. Trench the bed you intend to grow it in, and add plenty of manure to the lower part. This can hardly be overdone. The plants should be set out about 3 feet between them every way. There is one thing that is very important in rhubarb culture, and that is not to pick a stalk from a plant the first year. There are two crops as a rule—one in the early spring, and another in the autumn. If after the plants get established—that is, the second year—you wish to have an early crop you must leave the autumn crop alone, and let it die down. The second season you will have as much as you want. A bed will last years with liberal manuring, and then some of the old shoots may be taken up and divided with a spade and replanted to form a new bed. This new bed must be treated the same as the first, and not pulled the first season. That is the culture for both the winter sorts and the spring variety.—''Producers' Review.''

EXPERIMENTS IN CANE PLANTING.

In a report of different experiments in cane planting conducted in the island of St. Croix, West Indies, it was found that over an average of eight plots, cane grown from first ratoon plants gave an average of 54.8 tons per acre, as against 41.8 tons for plant cane cuttings, and 34.3 from those obtained from second ratoons. The variation, however, was greater in the case of the ratoon cuttings, namely, from 38.8 tons to 52.2; whereas in the case of plots derived from plant crops, the highest tonnage was 45.3, and the lowest 35.6 tons, being a difference of only 9.7 tons, as against a difference of 13.4 tons where first ratoons were used.—''South African Sugar Journal.''

General Notes.

THE MANUFACTURE AND USE OF PEANUT BUTTER.

That peanuts thrive and produce heavy crops wherever grown in Queensland has been long ago proved. The market for the bulk of this produce is not within the State, there being no factory established in it for utilising the nuts by the production of oil or peanut butter. It is possible that few farmers in Queensland have every heard of such a product. From an exhaustive pamphlet on the subject, issued by the United States Department of Agriculture (Circular 128, Sept., 1920), we obtain much interesting information on the manufacture of this product, which might in time be one of the payable products of this State.

We are told in the said circular, that the production of peanut butter has, in recent years, developed to large proportions, as evidenced by the fact that one manufacturer alone produced about 6,000,000 lb. in 1919, and there are dozens of large factories, and hundreds of smaller ones. All told, peanut butter is probably the most important peanut product manufactured in the United States. The peanuts used in making this butter in 1919 probably totalled six or eight million bushels. In the early days of its manufacture peanut butter was sold largely as a food for invalids, but it soon outgrew this limited use. Now it is considered a standard luncheon delicacy, especially in the making of sandwiches, though it is used in various other ways.

FOOD VALUE OF PEANUT BUTTER.

Peanut butter is a wholesome and highly nutritious food, having a much greater food value than round steak. The following are the analyses of peanut butter and steak:—

Peanut Butter.—Water, 2.1 per cent.; protein, 29.3 per cent.; fat, 46.5 per cent.; carbohydrates, 17.1 per cent.; ash, 5 per cent.; fuel value, 2,825 calories per pound.

Round Steak.—Water, 65.5 per cent.; protein, 19.8 per cent.; fat, 13.6 per cent.; carbohydrates, none; ash, 1.1 per cent.; fuel value, 950 calories per pound.

These figures show that peanut butter contains one and a-half times as much protein, more than three times as much fat, nearly five times as much ash, and three times as much fuel value as round steak. In addition to this, peanut butter contains 17.1 of carbohydrates, while steak contains none. Pound for pound, peanut butter has a much greater food value than steak, though it sells for a lower price.

In dealing with the commercial manufacture of this butter, a full description is given of the necessary machinery needed and of the processes in connection with the manufacture on a large scale.

HOME MANUFACTURE OF PEANUT BUTTER.

From what has been said about the commercial manufacture of peanut butter, it is evident that the process is very simple. Usually nothing is taken from the peanuts except the germs and red skins, and nothing is added except a small quantity of salt. Many persons have the idea that peanut butter consists of ground peanuts mixed with oil. As shelled peanuts contain from 13 to 50 per cent. of oil, depending on the variety, it would be unnecessary to add oil. The only difference between ground peanuts and peanut butter is in the fineness of the particles.

A cheap wholesome peanut butter can be made at home by means of an ordinary meat grinder. Raw unshelled or raw shelled peanuts can be bought from dealers and roasted in the oven at home, or peanuts that have been roasted can be obtained. When roasting peanuts in the oven care should be taken to prevent burning. The nuts should be stirred from time to time in order to get a uniform roast. Greater care is necessary in roasting shelled than unshelled nuts, as the former are more easily scorched. By examining the peanuts from time to time during the process the desired degree of roasting can be given.

When unshelled peanuts are used they should be roasted in the shell and cooled. After cooling they should be shelled and blanched. The blanching can be accomplished by rubbing the meats over a wire-bottom screen. This rubbing removes the red skins and loosens the germs. If the screen has holes of the proper size the germs can be sifted out. The meats can be readily cleaned by pouring them from one vessel to another in the open, where the wind will blow out the skins.

After the meats are cleaned they are ready for grinding. The salt may be added before or after grinding. A good type of meat grinder is satisfactory for grinding the peanut meats provided the burrs are not worn. The finest burrs should be used and the machine should be set to grind the meats as fine as possible. If the butter is not fine enough after running it through the machine once, it should be put through again. When salt is not added to the nuts before grinding them it is advisable to add it to the paste before the second grinding.

In order to be sure of a good grade of peanut butter it is best to make it often rather than to make a supply which will last for several months. When made at home the actual cost of peanut butter is much less than the price paid in the stores; in fact, it should not exceed 15 or 20 cents a pound, which is a very low price for a product of such high food value.

The pamphlet concludes with the uses of peanut butter in cookery.

OF INTEREST TO RUBBER PLANTERS.

WHAT EVERY PLANTER OUGHT TO KNOW.

BY FRED KNOCKER, F.Z.S.

(Author of *Hevea Braziliensis* in British Malaya).

From "The Planters' Chronicle," Madras.

A SIMPLE LESSON ON THE PHYSIOLOGY OF HEVEA BRAZILIENSIS.

(*Continued from January issue*).

In the first instance water is taken into the tree by its roots, the reason for this being the very patent fact that before any food can be assimilated by the plant it must be in a state of solution. So is nitrogen, phosphorus, sulphur, potassium, and such-like introduced into the stem from the soil, *viâ* the roots. There is, however, one very essential element of plant food that cannot be passed in through the roots—to wit, carbon. Speaking at random, I believe, about half a cubic foot of carbonic acid gas goes to 1,000 cubic feet of air. That is not much; but is the rubber tree's opportunity. By the aid of the green corpuscles of the leaves (known as chlorophyll) acted upon by the sunlight the carbon dioxide (CO_2)—*i.e.*, carbonic acid—on entering the leaf is decomposed, the carbon absorbed by the plant and the oxygen restored to the atmosphere. This absorbed carbon is combined with the water taken in by the roots, but a goodly portion of the water escapes by the leaves, naturally far more at night. This overflow, as it were, is not wasted, as we are all well aware. It falls to the ground to be again used by the roots in absorbing the chemicals from the soil. It will be at once perceived that evaporation relies largely upon existing conditions, the principal factor being the amount of light—*i.e.*, the greater the light the greater the transpiration. From this fact follows the highly important one that, by what may be considered a process of suction, the leaves themselves supplement the root pressure from below in inducing the sap to flow upwards. Again, it follows that the more active the transpiration the more rapid the sap circulation. Think what this means in the light of our present knowledge: the heavier your rubber tree's foliage the greater the evaporation—the darker the shade of the green colouring of the leaves the greater the absorption of carbon. Yet still we cannot grasp the intrinsic value of these facts without a little more learning. So let us hark back to the stem and analyse our next household word—bark.

What is commonly regarded as bark is the dead outside tissues of the cork (epidermis); but accepting the word in a wider sense then it can be made to include all those layers external to the cambium, more appropriately named the cortex. I do not believe there is a planter in the whole of Malaya to whom it is necessary to explain that the cambium is the active formative part of a tree immediately underlying the inner bark and separating it from the wood. Likewise, that the cambium gives rise internally to the wood and externally to the inner bark, otherwise known as the *phloem* or *liber*, and which, in the Para rubber tree, is celebrated for its laticiferous vessels. Outside the liber is the middle bark known scientifically as the *phelloderm*, also latex-bearing. Then you get a layer of cork, and with this cork goes another formative tissue often called the cork *cambium* but more correctly named the *phellogen*. Differing from the true cambium, however, it has the power of reproducing laterally. In that connection it often aids opportunely the healing of not-too-serious tapping wounds.

There is just one other thing to note in the physiology of the cortex, and that is the cross layers of tissue which unite the middle bark with the pith by piercing the intervening layers, and which in consequence are known as the *medullary rays*—the "silver grain" of the cabinet-maker. From a rubber planter's point of view the importance of these rays are liable to be under-estimated, but to become familiarised with their true functional value we must now pick up the broken thread of the green leaf's story.

We have seen how transpiration is effected by means of the sap rising from the roots, and we have seen how carbon is taken in from the atmosphere through the medium of carbon dioxide. We left the carbon, so to speak, in the leaf combining with the water taken in by the roots. The chemical formula for water is universally known as H_2O; and bearing this in mind the reader at once perceives that the net result of this combination of carbon and water must be the formation of carbohydrates—*i.e.*, sugars and starch cellulose. These elements go to form an elaborated sap which is conducted down the outside of the stem and circulated by bast fibres composing the liber or inner bark. From the liber this elaborated sap is distributed in a lateral direction throughout the inner layers of the stem by means of the medullary rays (*vide et supra*).

Now, with no more than an iota of imagination, it can be readily understood how the prolificness of the laticiferous vessels and an expeditious and satisfactory bark renewal is dependable on the ever active co-operation of all these separate elements and processes. And it would appear, also, that, if cultivation is to be done at all to *Hevea braziliensis*, it should be concentrated on the development of the root and leaf systems. Granted both are largely dependent on existing natural conditions and environment, there is still much that the planter can do to help on nature with the good work. On the other hand it is self-evident that there has been a good deal done in the past that would never have been done at all if illumined by the light of the knowledge we have just acquired; and there still remains much being done to-day contrary to the laws instituted by nature for the creation of all that is best for the Para rubber tree, thereby handicapping her own powerful system for the production of healthy and vigorous trees. Take a walk round the *tote* and think it over.

Putting aside the fact that the latex-yielding proclivities of individual trees must vary in ratio to the degree of perfection attained by their root and leaf systems, it is equally apparent that the latex productivity of every tree is controlled by the varying activity of its transpiration—varying, that is, as we have seen, according to the supply of light and moisture. Hence, you get the heaviest yields any time during wet weather; but you get the heaviest yields from a combination of wet weather and the period of fully-matured and most luxuriant foliation. This period, speaking generally for Malaya, is in the month of January and thereabouts, when the rainy season drawing to a close allows of an increasing number of bright days interspersed with showers, and the trees have completely matured their annual equipment of new foliage.

So we are brought right back to the text of our article: ''Bark Renewal'' and ''the Origin of Latex''; and the reader may like to reperuse Dr. Bobilioff's remarks in the light of his newly acquired knowledge. Peradventure, like the author, whilst not actually disagreeing with the learned doctor and allowing for the obvious misnomer of the title ''Origin of Latex,'' he might feel inclined to pensively remark:—''Why all this experimental fuss to produce results which could be foreseen and were physically incapable of being otherwise?''

THE LESSON IN ABSTRACT.

Medulla (Lat. = the interior part) or Pith (Anglo-Saxon pitha, marrow): The dry and colourless axis, or centre, of the stem. It is surrounded by a layer of air vessels called the Medullary sheath.

Duraman (Lat. durus, hard) or Heart-wood: The outer, hard layers of wood, generally, more or less, darkly coloured, and constituting a ''back bone'' to the tree.

Alburnum (Lat. albus, white) or Sapwood: The outer layers of wood, pale in colour and composed of air-carrying vessels and sap-distributing fibres which pass the current of sap, taken in by the roots, upwards to the leaves.

Xylem (Gr. xylon, wood) or the Wood: The whole of the central part of the tree exterior to the medullary sheath—*i.e.*, the duramen and the alburnum.

Cambium (Lat. cambio, to change): The formative layer between the wood and the cortex out of which new wood and new inner-bark are formed.

Phloem (Gr. phoios, the inner bark of trees), Liber (Lat., inner bark) or Inner Bark: The inner layer of the cortex composed of vessels, soft bast, and bast fibres, the latter of which act as sap circulators of the elaborated sap brought down from the leaves.

Phelloderm (Gr. phellos, cork; derma, skin): The middle layer of the cortex which also contains laticiferous vessels.

Phellogen (Gr. phellos, cork; gennao, to produce), or Cork Cambium: The formative tissue from which the layer of cork is continually increased in thickness, and which by producing tissue laterally effectively covers over the renewed tissues of inner-bark formed by the cambium after tapping.

Cork: The outer layer of the cortex, the outside tissues of which exposed to the atmosphere become dead and eventually peel off under the expanding influence of the growth of the stem.

Epidermis (Gr. epi, upon; dermis, the skin): The dead outside tissues of the cork (*q.v.*) commonly called "bark."

Cortex (Lat. bark): The whole of the outside layers of the stem exterior to the cambium.

Medullary rays: The transverse layers of tissue uniting the pith with the middle bark (phelloderm), their function being to distribute the elaborated sap passing down the liber (*q.v.*) through the inner parts of the stem.

Transpiration: The process by which the superfluous water ascending the tree from the roots is exhaled through the leaf in the form of a vapour, thus forcing the roots to maintain a perpetual and efficient supply of sap circulating through the fibres of the sap-wood (*q.v.*).

Chlorophyll (Gr. chloros, green; phyllon, a leaf): The green colouring matter of the leaves which, under the influence of sunlight, decomposes the carbon-dioxide taken in from the air, fixing the carbon and setting free the oxygen.

Laticiferous vessels (Lat. latex, a liquid; fero, I bear): Elongated tubes containing a fluid which in *Hevea braziliensis* is known as rubber latex and occurs in the inner and middle layers of the cortex.

REVIEWS AND NOTICES OF BOOKS.

A Research on the Eucalypts and Their Essential Oils. By Richard T. Baker and Henry G. Smith. Government Printer, Sydney, 1920. Royal 4to, pp. 470, with 120 plates and numerous text figures.

In this fine work the authors have given us the result of many years' careful study of the principal and most important group of plants native to Australia, viz., the Eucalypts. The present work is more particularly directed to a study of the oils of the different species. Eucalyptus oils now find employment in many ways, their best known use probably being for medicinal purposes. The demand at present for medicinal oils is mostly for those having a high cineol content, the "British Pharmacopœia" standard being 55 per cent. of cineol. The question, however, is not yet settled as to whether cineol is the most valuable constituent in eucalyptus oils, and Messrs. Baker and Smith express the opinion that the medicinal value of eucalyptus oils is more probably due to an admixture of various constituents than to any one alone, but rightly conclude that a study of comparative therapeutic values of the oils of various species is a task beyond the scope of their work and more fitted for the medical practitioner. Few Queensland species have a high cineol content, the best being *E. populifolia,* the common "Bimbil Box" or "Poplar Box," which occurs over large areas of inland Queensland and New South Wales, the cineol content being 70 per cent. in the fresh oil; unfortunately, however, the yield is small.

An important use to which the oils of certain species is put is the separation of metallic sulphides by a flotation process, the principal species used for this purpose being *Eucalyptus dives* (Broad-leaved Peppermint). Among the most valuable of eucalyptus oils are those suitable for perfumery purposes. *Eucalyptus citriodora,* a species confined almost entirely to Queensland, has an oil composed almost entirely of the aldehyde citronellal, and is in considerable demand. Another Queensland species, *Eucalpytus Staigeriana,* occurs on the Palmer River districts, and has an oil which Messrs. Baker and Smith state could be used as a substitute for lemon oil as a flavouring essence.

The authors demonstrate their method of classification principally by the oils, and the distinct relationships between the leaf venation and the class of oil yielded are shown.

One hundred and seventy-eight species are dealt with, so that it will be seen that the authors have described most of the common Australian species, though we notice one or two of the commonest Queensland species are not dealt with, *e.g., E. papuana* and *E. alba,* both of which cover large areas of country in North Queensland. Both are probably very low oil yielders, and the authors make no pretence to have exhausted their subject, so that research in various species is still left for future workers. Seventeen species are featured by colour and twenty-four by black-and-white plates. A very handy feature is the figure of the seed capsule accompanying the botanical description of each species. This is certainly a great help, as capsules of Eucalypts are fairly persistent on the trees, or, if fallen, can generally be picked up under the tree.

In conclusion, as the authors are retiring from official life, we may be permitted to congratulate them sincerely on this the crowning product of their scientific labours. The work reviewed can be confidently recommended to anyone wishing a comprehensive account of the Australian Eucalypts. Unfortunately no price is marked on our copy.—C.T.W.

CHATS ABOUT PRICKLY-PEAR.

By J. H. MAIDEN, I.S.O., F.R.S., F.L.S., Government Botanist, and Director, Botanic Gardens, Sydney.

APPARATUS.

Rollers.—A good deal of useful work has been done in the crushing of pear by heavy rollers, and sometimes the bruised pear is sprayed in addition. Mr. James H. Doyle, of Invermein, Scone, had much experience with pear, and he used (when I was at Scone) what he called a roller and a crusher. The roller is much the heavier and consisted of a long ironbark log. The crusher is also a roller, but of iron, and is lighter. The crusher was used direct when the pear was not over 2 feet high. When the pear was higher the roller was used. Bullock teams were used for this work.

Sprayers.—One sprayer utilises the motive power of acetylene gas, which is generated as the spraying proceeds, but there are quite a number of sprayers on the market, as every orchardist and gardener knows.

Injectors.—Then we have various injectors—for example, the well-known English appliance (often like a walking-stick, to avoid the user stooping), in which a hollow point pierces a dandelion or other weed in a lawn, and pressure on a spring releases a little of the poison, which destroys the weed. One inventor uses a deliquescent pill in his injector, which is pressed into the pear. There are various injectors of more or less merit, chiefly in use in Queensland.

MY SCONE EXPERIMENTS OF 1907-8.

The most important practical result of these experiments was that they proved that pear cannot be killed by spraying alone. It is comparatively easy to kill the fleshy ''leaves'' (technically called ''joints'') of the prickly-pear, so that the plant may appear quite dead. For example, the pear on a 5-acre block was ''killed'' in that way. The above-ground vegetation appeared dead, and other work was proceeded with, but in the course of a few weeks the pear on this portion was almost as vigorous again as usual. Different blocks were treated with various strengths of arsenic, dissolved in a solution of caustic soda or carbonate of soda (washing soda).

Now, in a prickly-pear there is what is known in common language as a ''bulb.'' It is immediately underground, and it is nature's arrangement to enable the plant to tide over an excessively dry or difficult time—for example, injury to the joints or roots. The bulb is much like a joint in shape; the roots extend from it, and so do the joints. It is a store-house of what botanists call reserve material; it contains starchy bodies and water necessary for the continuance of the life of the plant.

The ordinary methods of spraying affect only the portion sprayed upon—that is, the above-ground portion; when trouble comes, the bulb just ''lies low,'' and in due course replaces the plant; given favourable conditions, the pear may be as bad as ever.

A number of experiments were made at Scone by wounding the bulb alone, and though this action was found to injure the vitality of the plant, it was not fatal. The implement employed was a weapon about 5 feet long, consisting of a strong wooden handle (like a rake-handle) capped with a steel point. In other words, the handle was shod with steel, and the cap was continued into a chisel-like weapon.

The method finally decided upon was to treat an area with the above weapon, and then spray the whole of the plant, taking particular care that some of the liquid ran into the wounded joint. It appeared that this should be done soon after the wounding—that is, the sprayer should soon follow the man engaged in stabbing, since nature begins at once to repair the wounds inflicted by the stabber, and to close the tissues to the free access of the poison.

When poison was applied to the wounded bulb I never knew a case of the plant failing to die. It was also found that the whole plant should be sprayed, and not the joints or leaves only. It was observed that when the bulb is injured the plant falls over and the joints lie prostrate on the ground, or, at all events, in most cases touch the ground in more places than before. This just suits the pear, which roots at every joint, and so multiplies the evil. But when the whole plant, wounded bulb and all, is sprayed, the whole of the plant dies. We traced the dead roots for a considerable distance, while the green portion of the plant was as dead as the proverbial cock-robin.

Having established the principle that the bulb, as well as the plant above ground, must be destroyed, the way is clear for inventors. Ingenious individuals are wanted to invent implements and devices to do this stabbing of the bulb economically. A twist of the wrist to open up the bulb is found necessary in practice. Devices for economically applying the poison to the wounded bulb are also required. I have already seen two such devices for poisoning and stabbing in one operation—an Australian one and an English one.

I am of opinion that the slashing or wounding of the joints recommended by so many experimenters with sprays is unnecessary, and therefore a waste of money.

Of course, bad pear country is impregnated with pear seed, and there is always a danger of pear reoccupying a paddock from this cause alone. If the plants are treated with a hoe as they appear, they may be destroyed without much labour.

The experiments showed that the best strength was 1 lb. commercial white arsenic and 1 lb. caustic soda, dissolved in 20 gallons of water. Caustic soda is a most acrid substance, of course, and produces severe sores on the hands, &c., of any person touching it. It is a more efficacious solvent than washing soda, but I fear that its dangerous nature will prevent most people from having anything to do with it.

On the whole, I think that an arsenical preparation is most efficacious. If, as the result of the further experiments, my view is borne out, then the official declaration of the fact will cause manufacturing chemists to fill requirements.

I do not attach so much practical importance to the bulb as I once did. I still think that the stabber should be occasionally used, with special plants, in order to make a good job.

MORE RECENT EXPERIMENTS.

Since 1910 the Department of Agriculture has supervised trials with numerous preparations, proprietary specifics, and mechanical methods of destruction suggested by officers of the Department and by others. A large amount of work has been done along this line, but with little or no success as to the great majority of the specifics and methods.

The difficulties of treating prickly-pear in any manner that has a commercial recommendation have also directed attention to such other agencies as fungi, bacteria, and insects, and various trials have been conducted by the Department along these lines, without anything definite yet being reached.

A COMPETITION SUGGESTED.

As to the future, I would make the following unofficial suggestions for a competition in clearing infested land:—

1. Arrangements might be made for the practical test of (*a*) spraying machines and other appliances and devices for the economical distribution of liquid and solid poisons with the view to the destruction of prickly-pear; (*b*) other machines, appliances, and devices for destroying pear.
2. Owners of specifics for the destruction of prickly-pear might be invited to conduct experiments.

The above experiments should be free of cost to the Government, except in regard to supervision of the experiments, and the application of such tests as may be necessary with the view to securing impartial comparative trials.

If there is a mechanical device or specific of special value, these experiments would probably disclose it, and the publication of a decision to that effect would immediately render the property of great value.

The way in which effect should be given to these suggestions would require consideration, but the problem would not be a very difficult one.

My personal experience so far leads me to the belief that some solid preparation of arsenic and soda (one containing more or less sodium arsenite) is most deadly to prickly-pear. Experiments in open competition may show that some other substance (including arsenious trichloride) is more efficacious.

Cost is the keynote of all work in fighting prickly-pear. Thousands of individuals know how to kill prickly-pear, but the agency may be too expensive or objectionable in some other direction.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR JANUARY, 1921.

Article.		JANUARY. Prices.
Bacon	lb.	1s. 5d.
Barley	bush.	...
Bran	ton	£9 15s.
Broom Millet	"	£25 to £35
Broom Millet (Sydney)	"	£50
Butter (First Grade)	cwt.	238s.
Chaff, Lucerne	ton	£7 to £10
Chaff, Mixed	"	£8 to £8 15s.
Chaff, Oaten (Imported)	"	£9 to £10 5s.
Chaff, Oaten (Local)	"	£8 to £8 10s.
Chaff, Wheaten	"	£7 10s. to £8
Chaff, Panicum	"	...
Cheese	lb.	1s. 2d.
Flour	ton	£19 10s.
Hams	lb.	1s. 8d. to 1s. 11d.
Hay, Lucerne	ton	£5 to £6 10s.
Hay, Oaten	"	...
Honey	lb.	6d. to 7d.
Maize	bush.	5s. 6d. to 6s.
Oats	"	2s.
Onions	ton	£8 5s. to £11 10s.
Peanuts	lb.	5d. to 9d.
Pollard	ton	£9 15s.
Potatoes (English)	"	£2 15s. to £10
Potatoes (Sweet)	cwt.	2s. 5d. to 4s. 9d.
Pumpkins (Cattle)	ton	£3 10s. to £5
Eggs	doz.	1s. 4d. to 1s. 7d.
Fowls	per pair	7s. 10d. to 10s. 6d.
Ducks, English	"	6s. to 6s. 9d.
Ducks, Muscovy	"	9s. to 15s.
Geese	"	15s. to 16s.
Turkeys (Hens)	"	15s. to 23s.
Turkeys (Gobblers)	"	36s. to 50s.
Wheat (Chick)	bush.	7s. 6d. to 8s. 3d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans (French), per sugar bag	2s. to 11s.
Beetroot, per dozen bundles	...
Cabbages, per dozen	2s. 6d. to 6s.
Carrots, per dozen bunches	1s. to 2s.
Cucumbers, per dozen	3d. to 1s. 6d.
Lettuce, per dozen	..
Marrows, per dozen	1s. to 3s.
Peas, per sugar bag	6s. to 14s. 6d.
Potatoes (Sweet), per sugar bag	2s. 6d. to 4s. 9d.
Pumpkins (table), per doz.	2s. to 10s. 6d.
Rhubarb, per bundle	...
Tomatoes (prime), per quarter case	5s. to 11s.
Tomatoes (inferior), per quarter case	1s. to 5s.
Turnips (Swede), per cwt.	...

SOUTHERN FRUIT MARKETS.

Article.	JANUARY. Prices.
Bananas (Tweed River), per double case	15s.
Bananas (Queensland), per double case	20s. to 25s.
Bananas (Fiji), per double case	...
Cape Gooseberries, per case	...
Lemons, per bushel case	9s. to 12s.
Mandarins, per case	4s. to 6s.
Oranges (common), per bushel case	20s. to 25s.
Oranges (Navel), per bushel case	16s. to 18s.
Passion Fruit, per half bushel case	5s. to 8s.
Pineapples (Queensland), per double case	20s. to 25s.
Pineapples (Ripley), per double case	10s. to 14s.
Pineapples (common), per double case	10s. to 14s.
Tomatoes (Queensland), per quarter case	12s. to 20s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel case	8s. to 19s.
Apples, Cooking, per bushel case	3s. to 9s.
Apricots (prime), per half bushel case	2s. to 8s.
Apricots (inferior), per half bushel case	2s. to 4s.
Bananas (Cavendish), per dozen	½d. to 10d.
Bananas (Sugar), per dozen	4d. to 10d.
Bananas (Lady's Finger), second quality, per dozen	...
Bananas (Lady's Finger), third quality, per dozen	...
Cherries, per tray	12s. to 16s.
Cocoanuts, per sack	£1 5s.
Grapes, per lb.	3d. to 6d.
Cape Gooseberries, per quarter bushel case	...
Lemons (Lisbon), per quarter case	5s. to 8s.
Mandarins, per case	...
Mangoes, per case	3s. to 6s. 6d.
Nectarines, per quarter case	3s. 6d. to 6s.
Oranges (second crop)	1s. 6d. to 3s.
Papaw Apples, per tray	2s. to 4s. 6d.
Passion Fruit, per quarter case	4s. 6d. to 9s.
Peaches, per quarter case	1s. 6d. to 6s.
Pineapples (smooth), per case	6s. to 9s.
Pineapples (rough), per case	3s. to 8s.
Pineapples (Ripley Queen), per case	1s. 6d. to 5s. 6d.
Plums, per case	1s. to 5s. 6d.
Rockmelons, per dozen	1s. to 6s.
Water-melons, per dozen	1s. to 12s.

TOP PRICES, ENOGGERA YARDS, DECEMBER, 1920.

Animal.	DECEMBER. Prices.
Bullocks	£18 5s. to £21 15s.
Cows	£14 2s. 6d. to £16 5s.
Merino Wethers	32s. 9d.
Crossbred Wethers	39s. 6d.
Merino Ewes	26s. 3d.
Crossbred Ewes	32s. 9d.
Lambs	27s. 3d.
Pigs (Backfatters)	£7 11s.
Pigs (Bacon)	£5 9s.
Pigs (Porkers)	£4 10s.
Pigs (Suckers)	£1 7s.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER, 1920 AND 1919, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1920.	Dec., 1919
North Coast.	In.		In.	In.
Atherton	7·33	19	8·71	1·13
Cairns	9·21	38	8·37	1·01
Cardwell	8·42	48	4·23	0·73
Cooktown	7·07	44	6·89	1·43
Herberton	5·51	33	7·85	0·77
Ingham	7·16	28	6·26	1·26
Innisfail	10·29	39	5·31	1·34
Mossman	12·56	12	9·51	2·59
Townsville	5·61	49	1·21	0·68
Central Coast.				
Ayr	3·73	33	2·78	0·93
Bowen	4·37	49	2·19	0·09
Charters Towers ...	3·51	38	3·67	0·22
Mackay	6·85	49	2·37	0·14
Proserpine	8·65	17	2·10	0·27
St. Lawrence ...	4·29	49	0·92	0·03
South Coast.				
Biggenden	4·14	21	3·55	0·45
Bundaberg	4·27	37	10·59	0·05
Brisbane	4·87	69	2·57	1·58
Childers	4·79	25	7·90	0·22
Crohamhurst ...	7·32	25	3·09	0·45
Esk	4·20	33	1·66	2·01
Gayndah	3·71	49	6·98	0·53
Gympie	5·68	50	3·07	0·06
Glasshouse M'tains	6·64	12	2·77	1·26
Kilkivan	4·10	41	3·17	0·03
Maryborough ...	4·39	49	10·08	0·10
South Coast—continued:	In.		In.	In.
Nambour	6·10	24	3·67	1·13
Nanango	3·52	38	1·28	0·43
Rockhampton ...	4·28	33	0·98	0·39
Woodford	5·25	35	2·08	2·40
Darling Downs.				
Dalby	2·13	50	2·61	2·40
Emu Vale	3·47	24	3·01	2·47
Jimbour	3·09	32	0·88	1·86
Miles	2·42	35	2·84	0·84
Stanthorpe ...	3·43	47	2·84	0·93
Toowoomba ...	4·11	48	4·10	1·27
Warwick	3·44	33	2·40	1·62
Maranoa.				
Roma	2·28	46	2·50	1·73
State Farms, &c.				
Bungeworgorai ...	2·36	6	1·63	1·29
Gatton College ...	3·32	21	2·14	1·82
Gindie	2·68	21	1·49	0·52
Hermitage ...	2·76	14	2·31	1·73
Kairi	7·92	6	...	0·79
Sugar Experiment Station, Mackay	8·25	23	2·04	0·04
Warren	3·13	6	1·40	Nil

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December, 1920, and for the same period of 1919, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

COST OF A COTTON SEED OIL MILL.

The "South African Sugar Journal" (Dec., 1920) states the cost of an up-to-date oil mill erected in South Africa to make crude oil only would be about £900-£1,200 for each ton of seed to be crushed per day of twenty-four hours. The smallest workable plant would be one of 8 to 10 tons capacity. In addition to this, considerable working capital would be required.

Farm and Garden Notes for March.

FIELD.—Take every opportunity of turning up the ground in readiness for sowing and planting winter crops. The main crop of potatoes should at once be planted. As the growth of weeds will now be slackening off, lucerne may be sown on deeply cultivated soil. The latter should be rich and friable, with a porous subsoil. The land should be thoroughly pulverised. Do not waste time and money in trying to grow lucerne on land with a stiff clay subsoil. Prepare the land a couple of months before sowing, care being taken to cross plough and harrow before the weeds have gone to seed. This ensures a clean field. Sow either broadcast or in drills. In the former case, 20 lb. of seed will be required; in the latter, 10 lb. A good stand of lucerne has been obtained with less quantities. Should weeds make their appearance before the plants have sent down their tap roots, mow the field. Before they can again make headway enough to do any damage, the lucerne will be strong enough to hold its own against them. Harrow and roll the land after mowing. Gather all ripe corn. It is now too late to sow maize, even 90-day, with any certainty of harvesting a crop of grain. Rye grass, prairie grass, Rhodes grass, oats, barley (in some districts, wheat), sorghum, vetches, carrots, mangolds, and swede turnips may be sown. In Northern Queensland, sow tobacco seed, cowpea, carob beans, sweet potatoes, opium poppy, &c. Sow anatto, jack fruit, and plant kola-nut cuttings. Some temperate zone vegetables may be planted, such as egg plant, potatoes, &c. Coffee-planting may be continued. Harvest kafir corn and paddy. Cotton picking will now be in full swing. Pick cleanly, and expose to the sun for a few hours before storing or baling. Pick none but fully ripe bolls.

FLOWER GARDEN.—Now is the time to plant out bulbs. A complete garden could be furnished with these charming plants, which are to be had in every colour and variety. Amongst the many are—Amaryllis, anemone, arum, babiana, crinum, crocus, freesia, ranunculus, jonquils, iris, ixias, gladiolus, narcissus, jacobean lilies, tigridia, tritonia.

All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf mould. Herbaceous plants and annuals which it is intended to raise from seed should be sown this month. Such are antirrhinums (snapdragon), asters, cornflowers, dianthus, larkspurs, daisies, cosmea, candytuft, lupins, gaillardias, godetia, mignonette, poppies, pansies, phlox, sweet peas. Cannas now planted will require plenty of food in the shape of liquid manure. Put in cuttings of carnations. Chrysanthemums require attention in the way of disbudding, staking, watering with liquid manure, &c. Growers for exhibition will thin out to a few buds and protect the flowers from rain and sun. Dahlias should be looking well. To secure fine blooms, disbudding should be done.

Now, as to climbers which may now be planted. These are—*Allamanda Schotii* (beautiful yellow), *Antigonon leptopus,* a charming cerise-coloured climber; *Aristolochia elegans,* handsome as an orchid and easily grown; *Aristolochia ornithocephala* (Dutchman's Pipe), very curious, large, always attracts attention; *Asparagus plumosa* grows in any shady place; *Beaumontia grandiflora,* splendid white flower, grand for a fence, will grow 50 ft. high; Bignonias of several kinds; Bougainvilleas, with their splendid leafy pink and purple flowers, rapidly clothe a fence or unsightly shed with a blaze of blossom; *Quisqualis indica,* a fine creeper, flowers pink, changing to white; Wisteria, purple and white. Most beautiful is the *Bauhinia scandens,* rarely seen about Brisbane. We grew a plant of this climber at Nundah, and it soon closed in the front of the verandah for a distance of over 80 ft. The leaves are very small, and in the flowering season it presents almost a solid mass of beautiful round bunches of blossoms, something like the hawthorn bloom—pink and white. It seeds freely, but the seeds are difficult to germinate, and when they have produced a plant it is still more difficult to rear it. A rooted sucker from the main stem will in all probability grow.

KITCHEN GARDEN.—During this month a very large variety of vegetable seeds may be sown in readiness for planting out where necessary in the autumn, which begins on the 20th of March. All unoccupied land should be roughly dug, and, when required, add well-decomposed manure. Transplant cabbage, cauliflower, celery, &c. Sow french and broad beans, beet, carrot, turnips, radish, cabbage, cauliflower, cress, peas, onions, mustard &c. Former sowings should be thinned out and kept clear of weeds. Mulch round melon and cucumber beds with a good dressing of long stable manure, as it assists in keeping the fruit clean and free from damp. Cucumbers, melons, french beans, and tomatoes should be looked for every day and gathered, whether required or not, for if left on the vines to perfect their seeds, the plants will soon cease to be productive, or will form inferior, ill-shaped, and hence unsaleable fruit.

Orchard Notes for March.

THE SOUTHERN COAST DISTRICTS.

The marketing of the main crop of pineapples will continue to occupy the attention of growers; and as it is probable that the plantations have been allowed to get somewhat dirty during the previous month, they should be cleaned up as soon as ever the crop has been got off. The fruit of the new crop of citrus fruit will be showing signs of ripening towards the end of the month; and as the fruit during this period of its growth is very liable to the attack of insect pests of various kinds, it is important that steps should be taken to prevent loss arising from this cause as far as possible.

Large sucking moths of several kinds attack the fruit as soon as it shows signs of ripening; and as they always select the first fruit that shows signs of colouring, it is a good plan to gather a few forward fruit and to ripen them up quickly by placing them on a barn floor, and covering them up with bags or straw. They will turn colour in a few days, and develop the characteristic scent of the ripening fruit. The fruit so treated should be hung up in conspicuous places in the orchard as trap-fruit, as not only will it attract the moths, but also the fruit-flies. The moths will be found clustered round the trap-fruits in large numbers, and can then be easily caught and destroyed. Fruit-fly will also puncture such fruit; and if the fruit is destroyed before the larvæ reach maturity, a later crop of these insects is prevented from hatching out. Fruit-flies may also be caught in large numbers by means of such artificially ripened fruits. The fruits are smeared with tanglefoot, and hung about the orchard. The fly, attracted by the colour, settles on the fruit, and is caught in a similar manner to house-flies on specially prepared sticky paper. These simple remedies, if carefully carried out, will result in the destruction of large numbers of sucking moths and fruit-flies.

The yellow peach-moth that does such damage to peaches in spring, and that attacks corn, sorghum, cotton bolls, custard apples, and many other plants and fruits, often does a lot of damage to citrus fruits. It acts in a very similar manner to the second or later generations of the codling moth or pomaceous fruits, in that it lays its eggs where two fruits touch, under the shelter of a leaf on the fruit, at the stem end of the fruit, and, in the case of navel oranges, in the navel itself; in fact, anywhere that there is a likelood of the egg not being disturbed. The egg hatches out into a small spotted caterpillar, which eats its way into the fruit, causing it to ripen prematurely, and fall off. Where two fruits touch, it often eats into an destroys both, and it frequently leaves one fruit to go and destroy a second. It is a very difficult insect to deal with, owing to the number of fruits and plants on which it lives; but, as far as citrus fruits are concerned, the best remedy is undoubtedly to spray the fruit with a remedy that will destroy the young insect when it starts to eat the skin of the fruit. Bordeaux mixture has been found efficacious, but I am of opinion that spraying with Paris green and lime, Kedzie's mixture, or arsenite of lead, will also have good results. The latter poison is, in my opinion, well worth giving a thorough test, as it sticks to the fruit and leaves for a long time. Bordeaux mixture, either alone or in conjunction with Paris green or Kedzie's mixture, is, however, a good remedy, as not only will it destroy the laræ or prevent the moth from attacking the tree, but it is also the best remedy for black brand or melanose, as well as tending to keep all other fungus pests in check. Fight fruit-fly systematically—both by means of the sticky fruit already recommended and by gathering all fly-infested fruit, such as guavas, late mangoes, kumquats, &c., as well as any oranges or mandarins that may have been infested, as if kept in check now there will be little loss throughout the season. A little fruit will be marketed towards the end of the month. See that it is gathered and sweated for seven days before marketing, and don't gather it too immature. Beauty of Glen Retreat mandarins are often gathered and marketed as soon as they shows signs of colouring. They the then as sour as a lemon, and anyone who is unlucky enough to buy them will steer off mandarins for some time to come. This variety should not be gathered till thoroughly ripe, as when marketed in an immature state it spoils the market, as it puts people off eating citrus fruit.

Clean up the orchard after the summer rains, and have everything ready for the marketing of the crop. See that there is a good supply of clean, dry case timber on hand, as one of the greatest scources of loss in shipment is packing fruit in green cases.

Strawberry planting can be done throughout the month. Plant such berries as Federation on the lowest ground, and Aurie, Anetta, Trollop's Victoria, and Glenfield Beauty on warm, well-drained soils. Prepare the land thoroughly, so that it is

in perfect tilth, and in a fit state to retain moisture well; as on this, as much as anything, the success of the crop depends. Where new orchards are to be planted, get the land ready—not the clearing, which should have been done months ago, but the working of the land, as it is advisable to get it thoroughly sweetened before putting the trees in.

THE TROPICAL COAST DISTRICTS.

The Notes for February apply equally to March. Keep down weed growth, and market any sound citrus fruits. Clean up the orchards as well as possible, and keep pines clean. Get land ready where new orchards are to be set out, as tree-planting can be done during April and May. Pines and bananas can still be planted, as they will become well established before winter.

THE SOUTHERN AND CENTRAL TABLELANDS.

Finish the gathering of the later varieties of deciduous fruits, as well as grapes. Clean up the orchard, and get ready for winter. Get new land ready for planting; and where there are old, dead, or useless trees to be removed, dig them out and leave the ground to sweeten, so that when a new tree is planted to replace them the ground will be in good order.

In the drier parts, where citrus trees are grown, keep the land well worked, and water where necessary.

TO WATERPROOF CLOTHES.

SOME TRIED RECIPES FOR HOME TREATMENT.

In addition to what has already been published in the ''Queensland Grazier'' recently on this subject, the following might prove of use:—

''Every woman desires to be well dressed, but this very natural wish is not always easy to satisfy. For this very reason one cannot dispense with a mackintosh. We can never depend on the weather, and it is not wise, with a limited wardrobe, to run the risk of having new clothes ruined through a heavy and unexpected down-pour from which they would have been safely protected under a sensible all-enveloping raincoat.

''A really strong mackintosh that will stand any amount of hard wear and remain waterproof to the last is quite inexpensive to buy, and a reliable method of making one for herself is sure to be a welcome suggestion to any woman whose purse is slender.

''First buy some strong unbleached calico at about 7d. a yard, and get a good pattern of a loose rainproof coat which can easily be obtained—publications devoted to matters of feminine interest giving patterns. The pattern should be carefully studied before setting to work, as the discouraging experiences of many an amateur dressmaker is but the result of lack of attention in this respect. Do not stint the stuff, as it is better to have such a coat too loose than too tight.

''When completed, dampen it thoroughly and roll it up for a few hours. Now take 2 lb. of white lead paint ready mixed (at about 4d. per lb.), and to thin it down to the right consistency add to it a pint of raw linseed oil (6d. per pint). The mixture should be liquid, but do not, however, make it as weak as water. Apply one coating, and lay out the coat on a flat surface for about an hour, then hang it up to finish drying.

''Repeat the process three or four times, allowing each coating of paint to dry thoroughly before adding another. After this treatment the coat should be soft, pliable, as well as rainproof, and as durable as if it bore the label of a good house of waterproof makers.

''Perfect waterproof can also be obtained by soaking any woollen material for twenty-four hours in a liquid prepared by adding one gallon of cold water to ½ lb. each of sugar of lead and alum. Stir in the alum and sugar of lead, and allow to stand, stirring occasionally all day. Then pour off into a clean pail or tub, and into this put the garment. At the end of the twenty-four hours do not wring, but merely hang up in the shade and allow to drip dry. The process does not in any way stiffen the material. The quantity given would be sufficient to waterproof a skirt. For a mackintosh it would be well to double the amount, as there should be sufficient liquid to entirely cover the stuff.

''Riding habits thus made rainproof, at the cost of a few pence, are invaluable in the country.''

SEED TESTING.

Samples of any seeds purchased or offered for sale as seeds for sowing may be sent to the Department of Agriculture and Stock for examination.

WEIGHT OF SAMPLE TO MAIL.

Wheat, Oats, Barley, Maize, Rice, Rye, Peas, Cowpeas, Beans, Tares	8 oz.
Millet, Sorghum, Sudan Grass, Panicum, Buckwheat, Lucerne, Clover, Linseed	4 oz.
Rhodes, Paspalum	2 oz.
Turnip, Cabbage, Parsnip, Carrot, and Vegetable Seeds of like size	½ oz.
All Seeds other than those included above	2 oz.
Vegetable Seeds in made-up packets	3 packets

In the case of samples containing a large amount of Foreign Ingredients, it is advisable to send double the weight mentioned.

When drawing a sample be careful to obtain a quantity from the top, bottom, and middle of each bag. These should be thoroughly mixed to ensure the sample being uniform.

The name of the seed, quantity that the sample represents, also name and full address of the sender, should be on every sample.

If the result of the examination is required for purposes of sale, a fee of 2s. 6d. per sample will be charged.

No charge will be made to Farmers sending in samples of seed which they have purchased as seed for sowing, providing the following particulars are given:—

Vendor's name and address.

Name of seed.

Quantity purchased.

Date of delivery.

Locality where seed is to be sown.

Name and address of purchaser.

Samples, with covering letter, should be addressed to—

UNDER SECRETARY,

DEPARTMENT OF AGRICULTURE AND STOCK,

BRISBANE.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·22	6·42	5·41	6·20	5·58	5·46
2	4·58	6·45	5·22	6·41	5·41	6·19	5·58	5·45
3	4·59	6·45	5·23	6·41	5·42	6·18	5·59	5·44
4	4·59	6·46	5·24	6·40	5·43	6·17	5·59	5·43
5	5·0	6·46	5·24	6·40	5·43	6·16	6·0	5·42
6	5·1	6·46	5·25	6·39	5·44	6·15	6·0	5·41
7	5·2	6·47	5·26	6·38	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·1	5·39
9	5·3	6·47	5·27	6·37	5·46	6·12	6·2	5·38
10	5·4	6·47	5·28	6·36	5·46	6·10	6·2	5·37
11	5·5	6·47	5·29	6·36	5·47	6·9	6·3	5·35
12	5·5	6·47	5·30	6·35	5·47	6·8	6·3	5·34
13	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
14	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
15	5·8	6·47	5·32	6·33	5·49	6·5	6·5	5·31
16	5·9	6·47	5·32	6·32	5·49	6·4	6·5	5·30
17	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·50	6·2	6·6	5·29
19	5·11	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·12	6·46	5·35	6·29	5·51	6·0	6·7	5·27
21	5·12	6·46	5·36	6·28	5·52	5·59	6·8	5·26
22	5·13	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·14	6·45	5·37	6·26	5·53	5·57	6·9	5·24
24	5·15	6·45	5·38	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5·54	5·55	6·10	5·22
26	5·16	6·44	5·39	6·23	5·54	5·53	6·10	5·21
27	5·17	6·44	5·40	6·22	5·55	5·52	6·11	5·20
28	5·18	6·44	5·40	6·21	5·55	5·51	6·11	5·20
29	5·19	6·43	...	...	5·56	5·50	6·12	5·19
30	5·20	6·43	...	...	5·56	5·49	6·12	5·18
31	5·21	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H. M.
9 Jan.	●	New Moon	3 27 p.m.
17 ,,	☾	First Quarter	4 31 p.m.
24 ,,	○	Full Moon	9 8 a.m.
31 ,,	☽	Last Quarter	6 2 a.m.

Apogee on 9th. Perigee on 23rd.

8 Feb.	●	New Moon	10 37 p.m.
16 ,,	☾	First Quarter	4 53 a.m.
22 ,,	○	Full Moon	7 33 p.m.

Apogee on 5th. Perigee on 21st.

1 Mar.	☽	Last Quarter	abt. m'night
10 ,,	●	New Moon	4 9 a.m.
17 ,,	☾	First Quarter	1 49 p.m.
24 ,,	○	Full Moon	6 19 a.m.
31 ,,	☽	Last Quarter	7 13 p.m.

Apogee on 5th. Perigee 21st.

8 Apr.	●	New Moon	7 5 p.m.
15 ,,	☾	First Quarter	8 12 p.m.
22 ,,	○	Full Moon	5 50 p.m.
30 ,,	☽	Last Quarter	2 9 p.m.

Apogee on 2nd and 30th. Perigee on 17th at 3 p.m.

ECLIPSES.

An Annular Eclipse of the Sun visible in North of Scotland but not in Australia will occur on April 8th.

An Eclipse of the Moon will occur on April 22nd, when the Moon will rise totally eclipsed.

The Planets Venus, Mars, and Uranus will be remarkably close together apparently on January 9th, and will form a fine celestial picture with the Moon on the 13th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Queensland.

Department of Agriculture and Stock.

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Agriculture.

FIGHTING DROUGHTS.

AN ANALYSIS AND SOME SUGGESTIONS.

By CUTHBERT POTTS, B.A., Principal of the Queensland Agricultural College.

(Continued from February issue.)

The scheme outlined would be of considerable value if it could be established, because it would create an organised demand for fodder. Consequently supplies would be forthcoming to a degree. But this scheme, good as it may be in many directions, cannot hope to succeed, because there is no definite provision made to protect the producer of the fodder. Thus:—

1. Obviously, under this scheme, the purchase of the fodder would be made when the market prices were low. Further, if a sufficiency of fodder were conserved in, say, two or three years, no more would be bought. Hence, when the drought came, the conditions would be as follows:—

The high prices for fodder which are usually expected under drought conditions would not obtain. That is, the farmers would find themselves denied the high prices on which they now depend in order to partly compensate them for low yields in dry times.

Farmers generally would quickly recognise that such a situation had been rendered possible because they had produced and sold a surplus of fodder in the good seasons at a low price. The natural reflex action would be that farmers would restrict their production of fodder, and so fodder conservation would be rendered impossible.

2. In the above scheme an assumption is made that there would be a sufficient surplus of fodder grown to allow fodder conservation to be undertaken. It is more than doubtful, however, if this assumption is correct, for it cannot be expected that any true surplus of fodder will be produced unless the producer of the fodder is guaranteed a profit on his production.

The above scheme must fail because no provision has been made to meet this very essential feature. In the scheme, subsequently to be described, every precaution has been taken to protect those farmers who are called on to produce the surplus fodder for conservation.

3. The main objection, however, to the above scheme, and to all those other schemes constructed on similar lines, is this: If it is justifiable for the graziers to obtain Government assistance in order to buy fodder on a low market, would it not be equally justifiable for the farmers to seek Government assistance so as to enable them to hold their fodder as against the high prices which would normally rule in times of drought?

Under the conditions of the above scheme, and it is typical, the grazier is asking for Government assistance in order to make his work more profitable. Surely the farmer is equally justified in asking for Government assistance for his work. If Government is cut out, the whole problem becomes a purely commercial transaction between two opposing sections. To allow this, however, is undesirable, because our primary industries are basic to our national prosperity. Therefore, Government should take action, but such action as is taken must give equal advantages to both grazier and farmer. Beyond this we have to remember that many men are running stock and are farming on the same property.

Thus this discussion seems to have brought us to the conclusion that fodder conservation is the most important factor in the problem of fighting our droughts. Further, whatever the scheme for the conservation of fodder, it must be on lines of co-operation between grazier and farmer, though we must expect Government assistance, because the whole matter is of vital national interest.

With this I submit the following suggestive scheme, trusting it may be of some value when this matter of fodder conservation is brought up for serious argument.

SUGGESTED SCHEME FOR FINANCING FODDER CONSERVATION.

The object of the scheme is to provide an organisation whereby funds would be made available for the purpose of tiding the producer of fodder over that period of waiting which must elapse between the time of production in our good seasons and the time of sale or use in our bad seasons.

The argument set out above indicates that, to meet this situation, it is necessary to recognise conserved fodder as a safe security for a loan. Much of the following discussion, therefore, is necessarily devoted to an endeavour to show the lines on which fodder conservation (which is undoubtedly a good security for the nation), can be rendered a safe security for public investment.

The next object of the scheme is to stimulate the production of a true and large surplus of fodder during our good years and so render it possible to save our live stock as against the depredations of our droughts.

We cannot hope for the production of a surplus of fodder, however, unless it is made reasonably probable that the producer of the fodder shall make a profit.

In this respect it is evident that the greater the reserves of fodder which may be built up under any system of conservation, the less is the likelihood of high prices in times of drought. While low prices in times of stress are all in favour of the stock-raiser, they are against the interests of the farmer who is producing the fodder. This conflict of interest is the big difficulty in this problem, but it may be overcome under conditions set forth in the following scheme. In this scheme the suggested Fodder Conservation Bank should be in the position to guarantee to the fodder-producer a fair payable price during years of plenty. After several years of such profits the farmer should be in a position to forego high prices during the droughts.

But a drought may come before adequate reserves have been stored. Under such circumstances the conserved fodder must be quitted at high or fairly high prices, and it is necessary that any farmer who has placed his fodder under the conservation scheme, should obtain his share of those possible profits.

It will be seen below that provision for this has been made by the issue of conserved fodder certificates, thus allowing the farmer to retain an interest in the fodder he has conserved right up to the time of sale.

The security for the stockowners lies in the creation of large fodder reserves, for thereby, the prices of fodder in droughts would be kept low. These large reserves of fodder can be obtained by the whole-hearted support of the graziers in buying up fodder conservation bonds.

However, it is necessary that the investing stockowners should be protected against any undue holding of conserved fodder for the purpose of forcing prices above their true value. The suggested constitution of the Fodder Conservation Bank management should be a sufficient guarantee in this direction.

The third object of the scheme is to give the general public such an interest in the work that they will willingly invest their savings in fodder conservation bonds. To secure this investment it is necessary that conserved fodder should be made a truly safe security for a loan. The conditions set out below aim at this.

In brief, the objective of the whole scheme is to organise the nation in an endeavour to stabilise one of our greatest primary products as against our variable rainfall.

FODDER CONSERVATION BANK.

To handle the scheme some special organisation would be required which would act as an intermediary between the conservers of fodder, the users of the fodder, and the investing public. This organisation might be termed the Fodder Conservation Bank. In truth, fodder conservation might form one particular section of a Rural Bank which has been specially constituted for the purpose of handling agricultural and pastoral problems. Though fodder conservation only is dealt with here, it is believed that the conditions hereunder set forth are, with but slight modification, applicable to land mortgage, live stock loans, loans for re-stocking, loans for purchase of stud sires, &c. We will, however, confine this discussion to fodder conservation.

The Control of the Bank.—This should be placed under a board of five thoroughly practical men, one appointed by the Government to look after the interests of the investing public, two appointed by the investing graziers, and two appointed by the borrowing farmers who, as will be shown later, are of necessity investors also.

The Bank Fund.—In order to carry out its functions, the Fodder Conservation Bank will require funds. In the initial stages of any period of conservation the amount required will be small, but as reserves of fodder are built up so the funds required will increase. To meet this condition, it is proposed that the bank funds should be raised as follows:—

1. The Government to provide a limited sum, say, £100,000, to allow the bank to commence operations. Later the amount which Government provides might be set at a definite percentage of the bank's transactions. This sum would be in the nature of a fixed deposit by the Government, but it would also serve as an added security to the investing public in the event of the bank's failure.

This, in effect, is the general public's interest in the whole scheme, but not necessarily the interest of the investing public.

2. The bank to be empowered to issue bonds for public subscription, each bond issue to be secured, as will be shown later, on the actual fodder conserved. This issue might be termed "fodder conservation bonds," and they might be issued in £10, £25, £50, £100, £500, or £1,000.

Several conditions are suggested:—

(*a*) *Fodder conservation bonds to have a currency of 5 or 10 or 20 years, and to carry an interest similar to that paid on our national loans.*

(*b*) *The total permissible issue of fodder conservation bonds to be limited in accord with careful statistical estimates* of the probable requirements to meet a drought. From time to time, and as experience teaches, this limit might be altered by special enactment.

(*c*) *The issue of bonds at any one time to be dependent on the actual amount of fodder conserved.* Because of this condition it will be evident that the issue of fodder conservation bonds will be a gradually increasing quantity, depending on the gradual accumulation of fodder reserves. Further, the issue of these bonds will be during the good years when, because of the abundance of production, money is usually plentiful. Hence investors should be willing to accept a low rate of interest in return for safe security.

(*d*) *But this condition involves another point,* viz., that the bank would be required to buy up its own bonds to the extent to which it may have unloaded fodder in times of drought. This necessary recovery of fodder conservation bonds, particularly in view of the fact that their currency is for 5 or 10 or 20 years, would probably force the bonds above par. Because of this possibility, investment in fodder conservation bonds should be attractive.

It may be questioned whether it is justifiable for the Fodder Conservation Bank to be forced to buy up its own bonds at a premium. But a little consideration will show that this is correct. Thus:—

(i.) If the amount of conservation is small, say, because the time available for conservation has been short, then the selling price of that fodder under drought conditions would be high. Under such circumstances the Fodder Conservation Bank would be in the position to make big profits. The major portion of such profits would go to the producers of the fodder under the system of conserved fodder certificates, to be described hereafter. But another portion of these profits should justly go to those investors who have supported the scheme, and this would be attained because of the possible appreciation of fodder conservation bonds in times of drought.

(ii.) On the other hand, if fodder conservation has been going on through a number of good years and large reserves have been built up, it is obvious that the bond issue will be large. Thus, while the probable drought prices for the fodder would be low, so also the buying up of the bonds would be simpler and cheaper, both because the large issue of fodder conservation bonds would ensure that a number would be willing to quit, but also because many of the bonds would be nearing the end of their currency.

(iii.) Nevertheless there occurs here a very real danger that the Fodder Conservation Bank might be placed in an awkward position. Therefore the Government should be called on to take up 20 per cent. to 40 per cent. of all fodder conservation bond issue, the Government bonds to be redeemable at par and at the demand of the bank. Thus a very necessary element of security and stability would be introduced.

Fodder Conservation Bonds.—It has been advocated above that these bonds should be issued with a currency of 5 or 10 or 20 years. Probably it would be better if a portion were issued for 20 years, some for 10 years, and the remainder for 5 years' currency. In this way trust funds seeking permanent investment might be attracted by the long period bonds, while stockowners might be expected to prefer the short period bonds, merely because they might wish to realise, did drought conditions render it necessary.

As these bonds would be issued periodically and in accord with the building up of fodder reserves, it is obvious that the above arrangement would ensure that a number of bonds would be falling due at any given time. This, coupled with the Government bond holdings (*see* above) should place the bank in a secure position if it is forced to buy up many of its bonds because of a rapid unloading of its fodder stocks. At no time would the bank be forced to buy up the whole of its bond issue. This is rendered impossible because of its operations under Conservation B (*see* below).

However, the bank might be placed in a position where it is unable to buy up a sufficiency of its bonds to meet its unloading of fodder, in which case the bank would find itself with a surplus of funds because of the payment for fodder, such funds being idle and non-interest bearing. On this account, and under conditions carefully to be defined, the bank should be allowed to invest such funds in short-call securities. As the Fodder Conservation Bank would find itself with a superabundance of funds at the end of a drought (a time when money is usually scarce), there should be no difficulty in finding this outlet. Eventually this money would be recalled and invested in fodder conservation.

If fodder conservation were one section of a complete Rural Bank this rapid recovery of funds from the sale of fodder would be of distinct advantage, because it would place money in the hands of such a Rural Bank just at a time when agriculture urgently requires temporary assistance. The failure of our present system of financing agriculture lies exactly in this lack of a reserve to meet the aftermath of our droughts. In truth our present system of finance is such that money is usually extremely tight immediately following a bad drought. Yet, the least consideration shows that it is exactly at this period that agriculture requires assistance and support.

MARKET VALUE OF THE FODDER CONSERVATION BONDS.

Fodder conservation bonds should have a market value on our Stock Exchange. Should these bonds be below par at a time when the bank is asked to undertake further responsibility with regard to conservation, the effect would be that the bank would either have to charge the borrower a higher rate of interest on his loan, or else the amount advanced against fodder would have to be reduced. In either way it is the producer of the fodder who would have to suffer. This arrangement is quite justifiable, because the suggested Fodder Conservation Bank aims at quitting its conserved fodder at some profit and at distributing the major portion of such profits amongst those producers who have put fodder into the scheme. Thus, if the farmers are placed in a position to win if profits are made, so they must be prepared to lose if loss occurs.

However, if fodder conservation bonds did suffer any considerable depreciation over a length of time, the reflex action would be that the farmers would restrict their production and so render conservation difficult, if not impossible. On this account it should be distinctly to the advantage of the graziers to buy these bonds, and so hold them at a fair market value.

Also, in self-defence, fodder conservation rings (*see* p. 95) should buy bonds when they can.

Of course, if Government takes up 20 per cent. to 40 per cent. of all bond issue, as has been suggested above, this would steady the market.

THE FODDER CONSERVATION BANK'S FUNCTIONS.

If a bank were established as indicated above, the funds made available would be used for the purpose of advancing against conserved fodder. As has been indicated above (*see* page 54), there are three classes of fodder conservers. Each class has its risks and must be treated separately in order to establish its security. These three classes will be dealt with under the terms of "Conservation A," "Conservation B," and "Conservation C."

CONSERVATION A, OR, BETTER, FARM FODDER LOANS.

This section comprises the agriculturists who desire to hold their fodder for a limited period against seasonal variation in market prices. Many of this class merely desire to hold their material over from a period of glut in the full-growing season until the inevitable period of shortage in the non-growing season. Because of lack of funds many of these men are unable to do this. They have to realise in order to finance their home and working expenses. This gives the opportunity to the speculating merchant (*see* above, page 50). The speculator should not be in the position to make a profit in this matter; hence the necessity for this type of loss.

But there is another purpose that these loans would serve. With their assistance something approaching a normal annual value for each class of fodder would be established, and so allow of transactions under Conservation C (*see* page 96) to be undertaken with some chance of fair treatment to all concerned.

Advances to be made to conservers of fodder under this section are merely in the nature of a temporary assistance to tide over a limited period of waiting. Therefore the currency of such loan should not be for more than, say, two years. Should an extension of credit beyond this period be required, then the conserver *must* convert his holding to Conservation C (*see* below).

Conditions Appertaining to Conservation A Loans.—1. For Class A the advance against fodder conserved *shall not exceed an amount which may be previously determined as an approximate average cost of production.*

This being so, it can be anticipated that the fodder can always be disposed of at a value in excess of the loan on it. This security would be further enhanced by the operations under Conservation C. Hence there should be no incentive for the farmer to deliberately destroy his fodder, say, by fire, for he would always be in the position to gain a greater advantage by sale or by conversion to Conservation C. This places the individual farmer in a very secure position in the scheme.

The risk for the Fodder Conservation Bank, however, lies in the following:—The fodder may be accidentally destroyed by fire, or there may be actual malpractice—*e.g.*, a claim for excessive weight of fodder conserved, deliberate bad harvesting, or secret sale or disposal of the fodder without the bank's knowledge. To meet this the following *limited co-operative guarantee system is advocated*:—

The Limited Co-operative Guarantee System.—(*a*) Ten or more farmers, each desiring to obtain a farm fodder loan, *i.e.*, a loan under Conservation A, shall form a local fodder conservation ring or association, and elect their own management.

(*b*) The individual loans asked for shall carry the approval of the local management. This, however, will not commit the bank to make the loan, for, independent of the local management, the bank will have the right of investigation.

(*c*) Each farmer granted a loan under this section must take up fodder conservation bonds to the extent of 5 per cent. or perhaps 10 per cent. of his individual loan, such bonds to remain in force until the loan is fully repaid, when the par value of the bond plus all accrued interest shall be returned to the farmer.

(*d*) Each member of the Local Fodder Conservation Ring or association undertakes to pay to the bank an amount up to double the value of his fodder conservation bonds in the event of any member of his local ring failing. In this way each individual farmer's guarantee is strictly limited, yet the obligation is sufficient penalty to ensure that a "local ring" will not recommend any of its members for an improper loan.

(*e*) No farmer who has obtained a loan under this section is permitted to sell, or use, or otherwise dispose of his fodder unless with the sanction of his "local ring" management.

(*f*) This being so, any farmer may sell his fodder or portion thereof on notifying his "local ring," who in turn will notify the Fodder Conservation Bank authorities. In truth, this fodder might be sold under a certificate informing all agents that the proceeds must be paid to the vendor through the Fodder Conservation Bank.

(*g*) When a sale of fodder has been made, a repayment of the loan must be made in proportion to the amount sold. The "local ring management," because of their individual obligation, would see to this.

(*h*) If the fodder is used for any other purpose than sale, then the "local ring" management must be notified and they must take on themselves the responsibility of a fair estimate. Whatever the "local ring's" estimate of use, so the individual farmer must pay to the bank.

2. The interest to be charged to borrowers under this section Conservation A, *i.e.*, by those obtaining farm fodder loans, to be 2 per cent. in excess of the interest paid by the Fodder Conservation Bank on their issue of fodder conservation bonds.

3. Interest on the loan to be paid each six months.

4. Redemption of the loan in part or entirely, to be allowed at any interest date, such redemption to be independent of the compulsory repayment in the event of sale or use of the fodder.

5. It will be readily seen, especially when the conditions of Conservation C are taken into account, that all farmers borrowing under the conditions of Conservation A are well protected. It will also be noted that the independent action of this Class A, with reference to the open markets, must have a modifying effect on the bank in regard to any operations under Section C (*see* below).

CONSERVATION B, OR, BETTER, STOCK FODDER LOANS.

With this section we have a type of fodder-conserver who is quite distinct from Class A. Here we have men who are conserving fodder for the express purpose of feeding it to their own stock. Because of our erratic rainfall they may, and frequently will, be compelled to carry out much of their conservation in one or two good years, whereas the fodder may not be used for another three or four or more years. Thus, for this section of conservers there may occur a sporadic heavy expenditure, and such men will frequently require financial assistance. In this case, and considering the farmers individually, the security for a loan on fodder has little permanence, because the fodder may have to be used almost immediately. Still it must be allowed that if this conservation can be supported and stimulated, it would go far to stabilise the whole of our primary production and so be of vast national benefit.

Conditions Appertaining to Conservation B Loans.—To meet the peculiar conditions of this section, the following are suggested:—

(*a*) That the *Limited Co-operative Guarantee* system outlined above in Section A should be adopted. This would ensure the goodwill of a district as opposed to the individual.

(*b*) The advances against fodder held under this section shall only be to the extent of 60 per cent. of the estimated approximate cost of production.

(*c*) The currency of loans under this section shall not be for more than five years. The interest charged on these loans shall be 2 per cent. in excess of the interest paid on the fodder conservation bonds.

(*d*) The interest on these loans to be paid half yearly, together with a regular redemption of the loan in ten equal instalments. That is, that the whole loan should be worked off under the system of amortisation.

(*e*) Any borrower under this section is permitted to convert his holdings under Conservation C should he so desire, and subject to the conditions set forth.

The "limited co-operative guarantee" idea is fundamental to this section. For it is by such a means only that the bank can obtain any security as to the use of the fodder. The added security, however, is that not more than 60 per cent. of the cost of production of the fodder should be advanced. Whether this percentage may prove too high for safety or too low to stimulate production can only be determined by trial. But that some such limitation is justifiable is evident, because this type of agriculturist should be prepared to grow some fodder and conserve it for his stock each year. The assistance here suggested is merely to help him during times of exceptional expenditure, *i.e.*, during extra good years, when heavy conservation could take place.

Operations under this section should be large and should become proportionately larger with time. The main security for the bank lies in the co-operative guarantee, though this might be augmented by or replaced by a lien on the live stock. However, it is this section which will certainly protect the bank against the necessity of buying up the whole of its fodder conservation bonds at any one time. (*See* p. 93.)

FODDER CONSERVATION C, OR, BETTER, FODDER RESERVE LOANS.

In the two previous cases we have considered the individual who is a producer of fodder, and under both sections we can expect a considerable building up of fodder surplus. But this is not sufficient. Beyond this we want a large reserve for those stockowners who are so placed that, because of labour or climatic or field conditions, they are unable to conserve fodder. It would be wrong for these men individually to buy up or secure a lien on fodder conserved by others. This is patent, because in our great land we don't know when or where the drought may strike. It would be better if all surplus fodder were held under some central control so that it might be utilised immediately in that direction where it is most required. For this reason it is proposed that the Fodder Conservation Bank should purchase, under conditions, first-class fodder as occasion renders it feasible. This fodder should be placed in dumps situated with special reference to suitability for easy and rapid transit in times of need, or else the fodder may be stored in places where the supply of stock water is assured and the conditions are such that stock might be conveniently brought to the fodder.

Conditions Appertaining to Conservation C Loans.—It has been pointed out before that this Fodder Conservation Bank is an organised agency controlling the sale of conserved fodder. It is an agency acting on behalf of the producers of the fodder, but at the same time every precaution is being taken that there shall be no undue holding-up of stocks. That is, protection is given to the consuming stockman. Both Section A and Section B classes of loan should stimulate the farmers, the producers of fodder, to grow a surplus in good years. It cannot, however, be expected that the farmers should accept the whole risk of waiting. Therefore, as the surplus of fodder builds up, it must be taken up by the bank. For this purpose the following conditions are suggested:—

1. The bank will accept delivery of fodder which has been inspected and passed as of approved quality.

2. For this fodder the bank will pay, at the point of delivery, a predetermined price based on the statistical average over a number of years. Hence the value of operations under Section A. (*See* p. 95.)

3. On delivery the producer will be paid as above, but beyond this he will be given a *conserved fodder certificate* which would entitle him to a proportionate share of the bank's profits in the event of sale of fodder. Such fodder certificates might be given a life of five years from date of issue.

4. Obviously the selling price of the conserved fodder must be high if only a restricted reserve has been built up, and under these circumstances, the producer of the fodder should receive his share of the profits. On the other hand as larger reserves of fodder are obtained so the probable selling price must become lower. Therefore, *if these conserved fodder certificates are made saleable paper*, it would be to the advantage of stockowners to purchase them at the highest market value they possess, for by so doing they would assist to stimulate production of fodder. Nor could the stockowners stand to lose in this purchase. For, if a drought comes before reserves have been built up, so prices for conserved fodder must be high, bank profits must be high, and consequently payment on the conserved fodder certificates must be high.

But if large reserves of fodder have been built up, the price of conserved fodder certificates will be low and so would be the price of fodder, which is exactly what the stockowner wants. On the other hand, if the farmer has received a fair payable price for his fodder over a number of years, he should be well satisfied to forego high prices in times of drought.

FODDER CONSERVATION BANK PROFITS.

It will be gathered from the above detailed description that the suggested Fodder Conservation Bank is practically a co-operatively organised agency established for the purpose of controlling the conservation of fodder and its sale in times of need. In the bank organisation we have the *fodder conservation bond* holders on the one hand and the *conserved fodder certificate* holders on the other. The bank is acting in the interests of each and, therefore, in all its transactions it must aim at making such profits as will enable it to—

1. Pay the guaranteed interest on the fodder conservation bonds;
2. Pay some dividend on conserved fodder certificates; and
3. Build up a safe reserve fund (*see* later),

always provided there shall be no undue holding, to force prices up, with the object of paying excessive dividends on conserved fodder certificates. (*See* page 92.)

HOW BANK PROFITS CAN BE ASSURED.

1. It is evident that the Fodder Conservation Bank should make profits from its operations under the arrangements for Conservations A and B, always provided the conditions set forth are sufficiently stringent to ensure safe security. In each of these sections a direct loan is made to farmers who are then charged an interest which is 2 per cent. in excess of the interest which the bank pays its bondholders.

It may transpire, with experience, that this excess of 2 per cent. is too little or too much. (In this regard it is interesting to note that the Federal Farm Loan System of U.S.A. permits of an excess interest of not more than 1 per cent. on land mortgages.) Further interest is payable each six months, together with a partial redemption of the loan, so that the bank should always possess some funds for further operations.

2. But when we come to Conservation C we find very different conditions. Under this section the Fodder Conservation Bank is called on to expend money for the purchase of fodder, and on the annual charges of supervision, &c., and to accept the loss due to the shrinkage of the fodder and the risks of fire or other loss. For all this expenditure there is no regular half-yearly or yearly interest coming in. Instead, the bank has to wait until the fodder is sold before it can recoup itself. Therefore it is necessary that the ultimate selling price shall be sufficiently high to cover all accumulated charges.

If we assume that 7 per cent. per year is sufficient to pay all annual charges, say, 5 per cent. to bondholders and 2 per cent. for all other bank charges, then the approximate average cost of any conserved fodder may be got by taking into consideration—

(*a*) The probable shrinkage of the fodder; and

(*b*) The initial outlay plus 7 per cent. compound interest for the number of years stored.

Suppose that the bank bought up lucerne hay, say, at £4 per ton and that 100 tons were purchased in each successive year, then the following table illustrates how an estimate of the cost of conservation might be arrived at:—

Time.	Quantity of Fodder.	Value at 7 per cent. Compound Interest.	With equal Quantities of Fodder Stored each Year. The Accumulated Storage.	The Accumulated Cost.	Average Value per Ton.
	Tons.	£	Tons.	£	£
At start	100	400	..	..	...
End of—					
1 year	90	428	90	428	4·76
2 years	85	458	175	886	5·07
3 years	82	490	257	1,376	5·35
4 years	81	524	338	1,900	5·62
5 years	80	561	418	2,461	5·89
6 years	80	600	498	3,061	6·15
7 years	80	642	578	3,703	6·41
8 years	80	687	658	4,390	6·67
9 years	80	735	738	5,125	6·94
10 years	80	787	818	5,912	7·23
11 years	80	842	898	6,754	7.52
12 years	80	901	978	7,655	7·83
13 years	80	964	1,058	8,619	8·14
14 years	80	1,031	1,138	9,650	8·48
15 years	80	1,104	1,218	10,754	8·83

Column 2 shows an assumed shrinkage of the fodder through a number of years, it being taken that there would be practically no shrinkage after the first five years.

Column 3 shows the increasing capital expenditure calculated at 7 per cent. compound interest on the initial outlay.

Column 4 gives the total weight of conserved fodder, and is obtained from column 2 by successive additions.

Column 5 gives the total capital expenditure on the conserved fodder at the end of each year and is obtained from column 3 by successive additions.

Column 6 shows the estimated average cost per ton for conservation at the end of each year.

In some such way as the above an estimate of the cost of the conserved fodder might be arrived at. Having obtained this valuation we can consider the conditions which would protect the bank against loss.

Thus it might be established by enactment—

(*a*) *That the Fodder Conservation Bank shall not sell its conserved fodder at a price which is less than* 10 *per cent. in excess of the estimated cost of conservation at the time.*

By this, an assurance is given that the transactions of the bank under Section C shall yield a profit over and above that required to pay interest on the fodder conservation bonds, bank charges, &c. This profit would be distributed partly as a dividend on conserved fodder certificates and partly in building up a reserve fund.

(*b*) *That the bank shall not sell its conserved fodder at a price which is more than* 10 *per cent. below open market rates, except that it is herein provided that the selling price shall not at any time exceed the estimated cost of conservation by more than* 50 *per cent.*

The first part of this condition aims at preventing speculation in conserved fodder, while the second part gives the bank great powers in regard to steadying booming markets.

This condition, however, renders it possible for the bank to make large profits, but this could only occur under conditions which would have enabled the producer of the fodder to have made even greater profits had he held his fodder under his own control.

(*c*) *The bank shall not sell its fodder until the market values have reached some predetermined limit. This limit might reasonably be the estimated cost of conservation at the end of five years, plus* 10 *per cent.*

The term five years has been taken because, on a rough average, we get one bad year in every five or six, and also (*see* table above) because at 7 per cent. compound interest, the cost of conservation has increased the initial buying price by about 50 per cent.

The object of this condition is to prevent the Fodder Conservation Bank operating in fodder on the seasonal fluctuations of market values—Conservation A provides for such operations.

(*d*) *Whenever the estimated cost of conservation has reached a limit which has exceeded the estimated cost of conservation in the fifth year by* 50 *per cent., the Fodder Conservation Bank shall be relieved from the above conditions, and shall be permitted to sell the fodder at this limit and without profit. Further, even though the estimated cost of conservation shall have risen above this limit, because of forced holding, the bank may still sell at this limit.*

This is a very necessary provision, for it might happen that the bank was committed to such a prolonged period of waiting that further holding of the fodder would be, not only unprofitable, but would also involve a loss. It is not likely that such a condition would arise for (*see* the above table) it would probably require some fifteen years to reach the limit of value stipulated above. Still the condition might arise and, therefore, the bank should be in a position to cut its losses with as little delay as possible.

As a possible though improbable loss is here indicated, the bank must build up a substantial reserve fund to guard against failure.

(*e*) *The Fodder Conservation Bank shall be under no compulsion whatsoever to sell its conserved fodder on demand, even though all the above conditions as to market values shall be satisfied.*

This is a necessary provision in order to protect the bank against demands actuated by a temporary shortage in an otherwise fair season, when for the bank to operate would be detrimental to the producers of fodder and merely advantageous to certain improvidents. Whether the bank would or would not sell at any time would be largely determined by the statistical reports received from its fodder appraisers.

FODDER CONSERVATION BANK RESERVE FUND.

With these conditions in force there should be little doubt as to profits under Conservation C. It has already been pointed out that profits are assured under Conservations A and B. Out of these profits the bank should build up a reserve which would be required for the following purposes:—

(*a*) To meet possible defaulted loans under Conservations A and B.

(*b*) To meet possible losses under Conservation C due to fire, &c.

(*c*) To meet possible loss under Conservation C due to the compulsory sale of fodder at a price below the actual cost of conservation, such a possible contingency arising because the period of conservation has extended over an exceptionally long time (*see* page 99).

(*d*) To enable the bank to make regular interest payments to its bondholders. During the period of conservation the bank must have much of its money locked up in conserved fodder, and realisation of the principle, together with probable profits, is not possible until the sale of this fodder has been effected.

In this regard, the amount paid as interest to bondholders might be carried to a suspense account, this account to bear a compound interest at the same rate as that payable on the fodder conservation bonds. This suspense account would be debited against the reserve fund, but on the sale of the fodder the reserve fund would be credited with the amount of the suspense account, together with all accrued interest on that account.

The Fodder Conservation Bank might be required to devote 20 per cent. of all profits each year to the building up of this reserve fund until such time as the reserve shall have reached an amount which is equal to 25 per cent. of the permissible bond issue (*see* page 93). Until such a reserve has been fully built up, Government might be asked to back the bank to the extent of any difference between the actual bank reserve and 25 per cent. of the value of the then existing bond issue.

This reserve fund could only be invested in certain specially defined ways for, of necessity, it must be held as a liquid asset.

STATISTICAL SECTION OF THE BANK.

Throughout this discussion the necessity for statistical estimates has been several times mentioned. These estimates, in reality, form the very basis for the bank's successful operations.

First, a carefully compiled estimate of the probable fodder requirements for average droughts (if there is such a thing as an average drought) is essential to any conception of a safe margin for the bank's limit of operations (*see* page 93 2*b*).

Second, under Conservations A and B the loans made by the bank are based on the estimated average cost of production. Here again we have quantities which we can only hope to arrive at by means of careful statistical investigation (*see* pages 95 and 96).

Third, market prices require to be watched and tabulated so as to permit the bank to establish a fair estimate for its operations under Conservation C (*see* page 97).

Fourth, the bank requires to be fully informed as to condition of crops, private holdings of fodder, condition of different districts, &c. This information requires to be right up to date in order to enable the bank to decide whether it should sell or not (*see* page 99). In this regard much assistance can be got by reports from those experts who are called on to pass fodder before purchase by the bank. These experts—they might be termed ''fodder appraisers''—would be all over the country and should be in the position to furnish the bank with sound information. Another source from which good information could be obtained is from the local fodder conservation rings. But an even wider source of information would probably be required. All this statistical information would have to be recorded and tabulated and analysed, hence the necessity for a statistical section in the bank.

To begin with, it is not likely that a high degree of accuracy would obtain in many of the estimates, but a rapidly increasing degree of accuracy must result from the work of this section of the bank.

CONCLUSION.

Under the provisions set forth it would seem that ample security would be obtained, and so it could be anticipated that the public, once they realised the conditions, would support the scheme by investment in fodder conservation bonds.

With the assistance and protection afforded to the producers of fodder, as detailed under the several sections above, they should be induced to grow a true annual surplus of first-class fodder for conservation. Under existing conditions it is doubtful if any true annual surplus of fodder is ever grown. When a drought comes and there is a big demand for feed, any and all sorts of rubbish is collected, is put on the market as chaff, say, and is sold at exorbitant rates. But this rubbish is not true fodder, and it is more expensive than its price indicates, because of its utterly inferior quality.

With the large reserves of first-class fodder which, under the above scheme, the Fodder Conservation Bank should be able to build up, an ample security is given to the stockmen that they would be protected against much of the loss which is now imposed on them by the droughts.

But more than this: Should the scheme prove workable and worthy, there is every likelihood that it could be extended to such a degree that it would enable our graziers to stock up more heavily in good seasons, for there would be the protection of the fodder reserves behind them. In other words, such a scheme, if successful, would allow Australia to produce more in accordance with the possibilities of her average rainfall rather than, as at present, under the limiting impost of her recurrent droughts.

The object of the scheme has everything to commend it. I can only trust that this analysis may prove of some value in the solution of this, our greatest, problem—Fighting Droughts.

QUEENSLAND WHEAT POOL.

Though 1920 witnessed the formation of Queensland's first Wheat Pool, it must not be inferred that the idea as far as this State is concerned was a new one. Since the institution of the Pooling System in the Southern States, an agitation—faint at first, but growing in volume—has been continued until Queensland's wheat-growers have been placed in the happy position in which they are to-day.

On no less than two previous occasions, farsighted representatives of our growers were able to induce a sympathetic Minister for Agriculture and Stock to approach the Southern authorities, per medium of the Chief Secretary, with the object of securing Queensland's entry into the Southern Pool, and thus ensuring for wheat farmers the benefits being derived by their fellows in New South Wales, Victoria, and South Australia. The attempts, however, were unsuccessful, and for the time the matter was allowed to lapse.

Shrewd judges foresaw early in last year that, given beneficent weather, a record crop for Queensland was assured. Such was also the case in the Southern States. There, however, the system of Pooling was in operation. It had become practically necessary for Queensland to establish some similar system of control for various reasons. There was the danger of entry into Queensland of Southern wheat and flour, to the detriment of Queensland growers, whose own crop was probably more than sufficient to meet the whole of Queensland's needs. There was the further danger of the growers glutting their own markets, with the resultant certainty of a fall. There were innumerable other dangers and difficulties, such as marketing the surplus, railing, and shipping.

Meantime the tide of events in another quarter was sweeping towards the same goal. A sympathetic Minister for Agriculture, Mr. W. N. Gillies, realising the necessity of assisting the farmer after a succession of bad seasons and resultant fruitless toil, had influenced the Government to guarantee to Queensland growers a price of 8s. per bushel for all wheat of prime milling quality harvested during the 1920-21 season. The New South Wales Government had given a somewhat similar guarantee, and at a conference of Premiers with the Prime Minister it was decided to fix the price of milling wheat at 9s. per bushel, on a seaport basis, throughout Australia. Thus it was more than ever apparent from the growers' viewpoint that; to prevent exploitation and to secure for them the full benefit of these attractive prices, a central controlling body was essential.

A central controlling body to take advantage of the high price fixed and regulate the market was the only solution.

When, therefore, strong representations were made by the representatives of the growers, they found a sympathetic Government. "*The Wheat Pool Act of 1920*" was passed, and without loss of time the Minister for Agriculture, Mr. W. N. Gillies, had constituted a Wheat Board, comprised, with one exception, solely of wheat-growers. Mr. F. J. Morgan, Chairman and Financial Adviser, the exception referred to, held the position of manager of the Toowoomba Branch of the Bank of Queensland, and, as he had taken a prominent part in the agitation for the constitution of the Pool, and was, moreover, unanimously chosen by the selected representatives of the growers, it will be seen that Mr. Gillies had sufficient confidence in them to allow the farmers to, themselves, control their first Pool.

As was to be expected, many of them treated the innovation warily. Nearly two months' operations, however, have convinced them that they are now in possession of a power which they have striven for years to attain. By means of the Pool they have established complete control over the market. With a limited staff in its one and only office, the State Wheat Board is controlling the trucking (with the permission of the railway authorities), storage, and marketing of the crop. As for marketing without control by the Board, it was clear, as Mr. F. J. Morgan, Chairman, stated recently, in addressing the Toowoomba Chamber of Commerce, that considering the heavy crop the market would be glutted and the man who got in first would have got the good price. A Southern commercial gentleman of high standing had informed him (Mr. Morgan) that without pooling arrangements in Australia, in view of the enormous harvest, wheat would be worth little more than 1s. per bushel. It must be also borne in mind that, even with the prospect of securing a fair price without central control, the sum entailed by growers in the payment of agents' and merchants' handling charges, commission, &c., would in the aggregate be considerably greater than the amount it would cost the Board with its compact methods and efficiently conducted system of marketing.

The Board has also covered by insurance the whole of the season's crop from the time it has been bagged on the farms.

Queensland's system of control is more complete than is the case in any of the Southern States. There, much of the work in connection with handling and transport is left in the hands of their paid agents, the latter also having the work of issuing the certificates of payment. Here the State Wheat Board employs no agents. Beyond inspectors to watch the interests of growers at the mills, the whole of the staff is centred at Toowoomba.

The Queensland Board has also decided to cater for the growers by creating a subsidiary Pool for the marketing of inferior wheat. It is, of course, understood that this will finance itself, and enable the Board to make periodical payments to farmers interested. By this action the market has been stabilised, and much better prices will be secured than would have been the case had the sales of this class of wheat remained uncontrolled. In the Southern States this advantage has not been secured to the farmers. The different Wheat Boards assist the growers by arranging for marketing, but the proceeds are not pooled. Consequently it is a case of "first in, first served"—and it might be added, best served.

THE FARM PRODUCE AGENTS ACT.

It is apparent, from inquiries and complaints received by the Department of Agriculture and Stock, that the provisions of the Farm Produce Agents Act are not clearly understood by the agents and the farmers. Farm produce agents are obliged to renew licenses yearly, but their obligations do not cease there. A record of all consignments received, together with particulars of their sale or other disposal, must be kept. Account sales must be forwarded to principals within fourteen days after the sale of produce, and must contain the name and address of the agent and of the consignor, the date of receipt and sale of the produce, giving its class and weight, or quantity, details of all charges, and the rate of commission charged.

Upon sale of produce the balance of the proceeds, after deduction of commission, expenses, and any money owing to the agent by the principal, must, if not paid immediately to the principal, be paid into a bank to a trust account, and is not available for payment of any other creditor of the agent. No agent or employee is entitled to purchase, without the consent of the principal, any produce forwarded to him for sale, and in the event of consent being given, no commission is chargeable.

Any consignor, or any other person with his written authority, may, upon giving seven days' notice to the agent, inspect and take copies of any entries relating to his consignment.

LUCERNE-GROWING.

Since the rapid expansion of the dairying industry in Queensland, great attention has naturally been paid to experiences carried out at the Queensland Agricultural College and on the State Farms with several varieties of fodder. Amongst these, lucerne was found to be the best of all feeds for farm animals, including even swine and poultry. No single forage plant contains the materials for a profitable ration for dairy cows, sheep, and swine in the same degree as lucerne. The abundant root development of lucerne, and the great depth to which the roots extend when once established, enable the plant to secure food and moisture several feet below the surface, in some authentic cases as deep as 20 feet.

Good growths of lucerne are often secured in favourable seasons on level land, but better results will be obtained on land that is slightly sloping, where water will not stand during any season of the year. ''Patchy'' fields are hard to renew, and often necessitate reploughing and resowing. In no case should lucerne be sown on land that is subject to overflow, or where the water-level is but 2 or 3 feet below the surface. Lucerne will grow on a wide variation of soil, ranging from a rich sandy loam to a heavy clay; but a rich clay loam over a gravelly subsoil seems to be the best. It is practically useless to grow lucerne on sandy or ''worn-out'' soils without an abundant supply of good barnyard manure. Mr. W. D. Lamb, of Yangan, was a good authority on lucerne-growing, and his advice on the subject is a good guide to the lucerne-grower of to-day. He once wrote the following instructive paper on the subject for publication in this journal:—

''In the coast districts of Queensland, lucerne thrives best on alluvial flats and pockets on the banks of the creeks, where the lands are periodically fertilised by the overflow from the streams. Lucerne is a deep-rooter. It strikes down to a depth of 15 feet, and even from this depth continues to descend until it meets a hard subsoil or clay, which the roots cannot penetrate. When the plant reaches this stage it is at a standstill. Deterioration shortly afterwards begins to manifest itself, and the plant loses its vigour. Lucerne will hold fairly good for ten years. After this space of time the natural grasses begin to show, and the lucerne dies out. Land in which it is intended to plant lucerne requires good cultivation, and should be thoroughly mixed; three crops, at least, of maize or wheat should be taken off the ground prior to the sowing of the lucerne seed. These croppings cause the land to be worked thoroughly, and enable the agriculturist to rid the paddocks of all natural grasses, including couch and nut grasses, which are the deadly enemies of lucerne. If these are allowed to remain, the lucerne will not thrive, but will die out in a short time.

''On the rich lands of the Darling Downs and on the plains in the Lockyer district, lucerne thrives to perfection.

''The following instructions for growing this crop are intended more for the benefit of new settlers than for those farmers who have for many years been successful growers of this invaluable stand-by of the dairy farmer:—

'' ' The best land for lucerne is a deep alluvial soil, such as that on the banks of many of our rivers and creeks. If this is not procurable, the next best is that of the deep black soils of the plain country of the Darling Downs and other parts of the State. Shallow land, or land having a hard, retentive clay subsoil or hard-pan, should be avoided, as the lucerne plant is a deep rooter and requires a deep soil for its full development. No land is well adapted for lucerne-growing unless it contains a sufficient quantity of lime, as the presence of this plant-food is essential to its growth.

'' ' PREPARATION OF THE LAND.—Plough the land deeply some months before the seed is sown, so as to get it into the right condition. That means that the whole furrow must be brought into a state of fine tilth, so that when the seed germinates the young roots will be able to at once strike down deeply into the soil.

'' ' SOWING.—The best time to sow the seed is from the middle of March to the end of April, as this enables the lucerne to get a good roothold before the winter sets in, and thus be able to withstand the effects of the frost.

'' ' The drill is undoubtedly the best machine with which to sow the seed, as by its means the seed is more evenly distributed over the land than by hand sowing. From 10 lb. to 20 lb. of seed is usual per acre.

'' ' I believe in sowing the seed through the coulter, not by means of a broadcast drill, as the seed is thereby placed at an even depth and, consequently, comes to the surface more regularly. It is a good plan to attach a light wooden harrow to the drill so as to smooth the land behind the drill, and to follow this by rolling as soon after as possible.

'' ' If the seed is sown in autumn, the lucerne will, in an ordinary season, be fit to cut for hay in September. Lucerne is best sown by itself, as the presence of stubble or other rubbish, which is always present when the seed is sown with wheat or oats, is thus avoided.

" ' AFTER CULTIVATION.—Once lucerne is established, say in twelve months after seeding, it is a difficult matter to over-cultivate it. The spring-tooth harrow or disc harrow is a grand implement to run through the lucerne after each crop is taken off, but if this is not always practical there must be at least one cultivation every spring. The more lucerne is cultivated the better it grows.

" ' HARVESTING.—The best time to cut lucerne for hay is just when the first blossom is showing. The great mistake which most of our lucerne-growers make is in allowing the lucerne to get too far advanced before cutting.

" ' GRAZING.—The great trouble in grazing lucerne is, that sheep and cattle are very liable to what is termed "blowing," but this can be overcome to a great extent by not letting the stock on to a paddock until the lucerne is 6 or 7 inches high. Once on lucerne, let the stock stay there, and, if this precaution is taken, my experience has been that there is practically no danger from "blowing."

" ' LUCERNE FOR SEED.—When lucerne is being grown for seed, the plants should be at least three years old, as it is not advisable to take off a crop of seed till the plants have reached full maturity, and become thoroughly established. A dry season is far better for getting a crop of seed than a wet one.

" ' The best time to cut lucerne for seed is when the lower pods are quite ripe and the upper pods are just turning brown.

" ' Cut with an ordinary mower, taking care to remove the crop as cut out of the way of the horses by having one or two men to follow the mover for this purpose. A sidedelivery reaper, or a reaper and binder without string binding attachment, can also be used.

" ' When cut allow it to become thoroughly dry before stacking, or, better still, if machinery is available, thresh at once from the field, without stacking.

" ' The ordinary wheat-threshing machine is suitable for threshing lucerne—in fact, it answers the purpose very well, with a little alteration.

" ' YIELD.—The yield of seed per acre varies from 50 to 400 lb. per acre, which, provided all weather conditions are favourable, is a good paying crop, but the risks are great, as at least two good crops of hay have to be sacrificed to get one crop of seed.' "

THE COTTON INDUSTRY.

Referring to the visit of Messrs. Vaughan, Johnstone, and Armstrong, representatives of the British Cotton Growing Association, who are investigating the possibilities of profitably growing cotton in Queensland, Mr. David Jones, cotton expert, who was deputed by the Minister for Agriculture to accompany them as cicerone to the existing cotton-growing districts, gave to the "Daily Mail" (11th February) the following notes on his mission:—

"At a reception given to the visitors by the civic authorities at Cairns, the subject of cotton-growing was naturally discussed in its most serious economic aspect, and opinions were expressed by Dr. Reid, a well-informed sugar-grower, as to the expediency of embarking in the production of cotton in a country where labour conditions are deemed to be adverse. He thought that caution should be observed, instancing the difficulty experienced in the north with labour for rural pursuits in particular. Fortunately for the cotton-grower he is of all settlers engaged in agrarian operations the most independent of his class in respect to the question of labour, be it in supply or cost. Cotton, like sugar, has a harvest period extending over several months, according to the type of plant cultivated. This being so, a grower is not harassed by economic, labour, or other conditions to the extent experienced by the sugar-grower. Cane must be cut at the opportune time, and must be delivered without delay; hence a great deal of rush work, adding to the costs is unavoidable. With cotton it is not so. If a farmer has a good lot of fibre exposed he is in no way compelled to hustle more than he cares in order to gather the article. If he has no ability to pick the fibre one day, he can safely leave it until a more convenient time, be it a week or a month, or even more. The question of cost of labour in connection with cotton-growing has been much magnified by folk unfamiliar with the subject. It is often said that wages in Queensland are on too high a scale to make the production of cotton profitable. As counter to this idea, I have definite proof that, even if wages are paid much in excess of what is ordinarily given in farming districts, we have evidence that the crop can be profitably raised. During a visit to the Central district recently, Mr. Vaughan and party obtained conclusive data that, given ordinary seasonal conditions and the means to cultivate the crop on up-to-date methods, it is patent that cotton, as a family occupation, can be more cheaply raised here than is the case in other countries, whatever the character of labour employed. Many planters were interrogated as to cost of bringing an acre of cotton to harvest period in scrub and forest areas, and the answer was in every instance such as to show that we can

compete in the world's markets with profit. A grower at Capella showed me his accounts for the cost of tillage of his 10-acre plot, and the total expenses of ploughing, scuffling, chipping, and thinning was £31 10s. He had credited himself with a generous cost for ploughing—35s. an acre—and paid a labourer 15s. 6d. per day for field work. On this excessive basis of cost, his crop will, by a fraction, exceed three farthings per pound of seed cotton, and, if his yield exceeds the 1,000 lb. of fibre per acre expected, it will be much less. Or, if it reaches what one grower in the Dawson Valley scrub averred his 1918 crop attained—a return of 2,000 lb. of seed fibre per acre—then the cost per pound will be very low indeed. As it takes 3 lb. of seed fibre to make one of lint, it will be seen that the cost per pound of lint is lower than that estimated in most other countries, even allowing 1d. per lb. in seed for picking. On scrub areas, the cotton seed is sown on the newly burnt plot, and the planting is done among the stumps with the hoe or an American maize planter, after the seed is clayed or submitted to other processes to allow it to run in the machine. By these means growers show that the cost of raising the crop to picking period will not exceed 15s. per acre. It will be at once conceded that, if the planter can get his cotton ready for the picking, and sold at the State guaranteed price of 5½d. per lb., it follows that a picker, if gathering 100 lb. a day, wins over £2 worth of cotton by his task each day. Realising this to be the case—and it can be done each day for several months in the year—it follows that the high estimate of labour costs has to be related to what can be earned in the vocation by the grower. Assuming a much lower price for the article (not necessarily the case if we grow our best varieties), it is still safe to conclude that cotton, being what Americans call 'a sure crop,' will grow in favour according to the interest taken in the subject by the State and Federal authorities, to whom this industry should appeal as one of the most important of rural pursuits.''

ONION GROWING.

TESTS DURING SEASON 1920 IN THE ROCKHAMPTON DISTRICT.

Mr. G. B. Brooks, Instructor in Agriculture, Rockhampton, has furnished the following report to the Department of Agriculture and Stock, detailing the results of onion-growing experiments on plots established for the purpose, one on the farm of Mr. E. A. G. Barnard, Deeford, Dawson Valley, and the other on the farm of Mr. T. C. Selerup, Scrubby Creek, Gracemere:—

''The soil on which the onions were grown at Deeford was a brown friable loam, originally covered with brigalow scrub. At Gracemere it consisted of a brown alluvial loam, also scrub land.

''The varieties tested were as follows:—Hunter River Brown Spanish, Extra Early Barletta, Brown Globe, and Yellow Danvers.

''Planting was carried out at both centres during the first week in May. A good germination was secured.

''Climatic conditions were adverse in the Dawson Valley during the winter months, the light showers that fell being of little benefit to the crop. As a result of the early summer rains, the crop recovered wonderfully, making fair growth. It was intended to harvest the varieties about the middle of January, but a heat wave, followed by wet weather, induced a fresh growth of tops to take place, making the crop unsuitable for market purposes.

''The crop at Gracemere made very good headway until September, when it was checked by a dry spell. Mr. Selerup, who was irrigating a field of potatoes alongside the onion plot at this time, turned the water on to the varieties, with the result that practically all the bulbs quartered, forming four separate onions. Although the bulbs remained sound after splitting, this occurrence spoiled what would otherwise have been an excellent sample.

''All varieties were harvested during the second week in January, the returns being as follows:—

Hunter River Early Brown Spanish	14 tons per acre.
Extra Early Barletta	11.9 tons per acre.
Yellow Danvers	9.2 tons per acre.
Brown Globe	9.1 tons per acre.

''The 'Hunter River Brown Spanish' were the best in regard to quality, followed by the 'Brown Globe.' The 'Yellow Danvers' were somewhat thick in the neck, the 'Barletta' being very faulty in this respect.

''The results obtained from the above, and previous tests carried out, go to show that, by adopting up-to-date methods in regard to the conservation of moisture, and ridding the soil of weed seeds, conditions in Central Queensland are suitable to the raising of onions as a paying farm crop.''

WINTER FODDER DEMONSTRATION TESTS.

During the past season these tests were carried out in the Rockhampton district, under the supervision of the local Instructor in Agriculture, Mr. G. B. Brooks, whose report thereon is as follows:—

"The location of the plots, together with the names of the farmers in conjunction with whom the tests were conducted, are as follows:—

A. Collins, Marlborough;

S. Larson, Miriam Vale;

J. G. Hales, Rosedale;

W. Hunt, Milyando, Alton Downs; and

J. Arniel, Dululu, Dawson Valley.

"At Marlborough and Miriam Vale, the soil on which the crops were grown was an alluvial loam. At Rosedale and Dululu the soil was somewhat irregular—varying from a brown loam to a greyish clay; while at Alton Downs the land was of a heavy black basaltic character.

"In regard to rainfall, this varied very considerably in the respective localities. At Marlborough, although sufficient for the production of grain, it was barely enough for a crop grown for fodder purposes. The wheat varieties, as will be seen from the accompanying photo., made a remarkable even growth, and had they been harvested for grain, an excellent return would have been secured. At Miriam Vale, climatic conditions were exceedingly favourable, several of the varieties lodging in places. At Rosedale the rainfall was equally satisfactory.

"The plot at Dululu was ploughed to a depth of some 12 inches, and again cross-ploughed shortly before sowing, on both occasions during very dry conditions. When the crop was put in there was practically no moisture in the soil, but a few light showers fell shortly after, inducing germination. Later, a heavy downpour of rain was experienced, unfortunately of very short duration, which saturated the depressions, the result being that the crop only developed in patches. While some portions were 3 ft. high, others were only 6 inches. As the grower was short of the necessary feed to keep his dairy herd alive, permission was given to graze the crop off.

"At Alton Downs, conditions were somewhat similar to the Dawson Valley, the rain that fell during the growing period not being sufficient to saturate the soil. As will be noted from the attached list of weights, the returns from all varieties on this plot were poor.

CONCLUSIONS.

"The tests carried out during the past three seasons have demonstrated that under Central Queensland conditions certain varieties of wheat are much superior to Algerian oats, both as a fodder and hay crop. Under dry conditions, Algerian oats are too backward; while, given a plentiful supply of moisture, they are subject to rust. The Ruakura oat is a decided improvement over the Algerian, in that it is not so susceptible to rust, so far only a trace appearing in the crop. The only drawback in growing this variety has been the difficulty in procuring seed.

"Canary seed has not come up to expectations as a fodder crop. The only satisfactory yield so far secured in the numerous tests carried out was at Rosedale, where a fine crop of succulent material was produced and converted into hay.

"Field pea and wheat have proved an excellent combination for fodder purposes, and one that should be more largely grown.

"Of the five varieties of wheat embraced in the tests this season, Florence appears to be the general favourite, this being due, in a large measure, to its early maturing habit and its fine even growth. 'Warden's Hay' and 'Cleveland' showed traces of rust.

"The objective aimed at in carrying out the above tests was to demonstrate that by sowing at one time certain varieties of crops, a continuous supply of fodder can be maintained throughout the winter months for dairy stock, &c. It is pleasing to report that in this respect the results obtained were most satisfactory. The order in which they became available for use was as follows:—First 'Skinless Barley,' closely followed by the 'Cape' variety. Then 'Florence' wheat, together with the Field Pea mixture. Next in order were 'Piastre,' 'Warden's Hay,' 'Indian Pearl,' and 'Cleveland' wheats. Ruakura oats followed—the Algerian failing on account of rust.

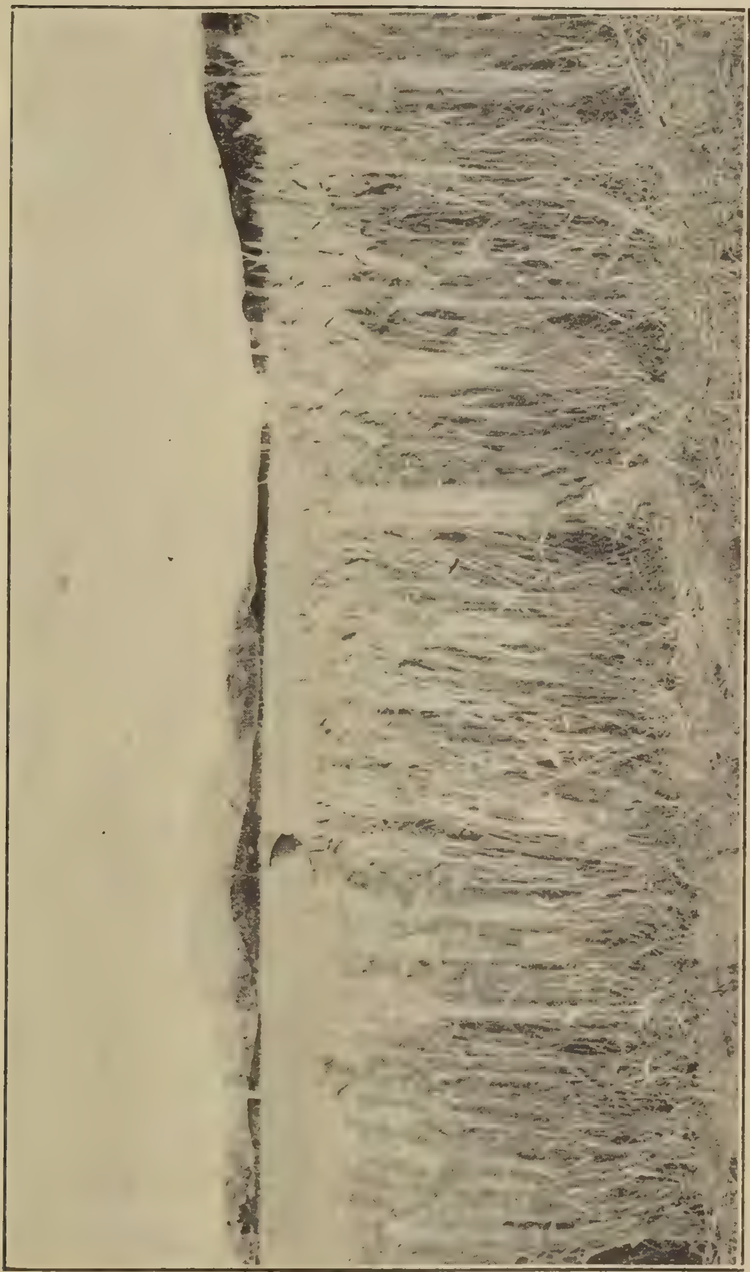

PLATE 10.—DEMONSTRATION OF WINTER FODDER CROPS ON THE FARM OF MR. S. LARSEN, MIRIAM VALE. CLEVELAND WHEAT.

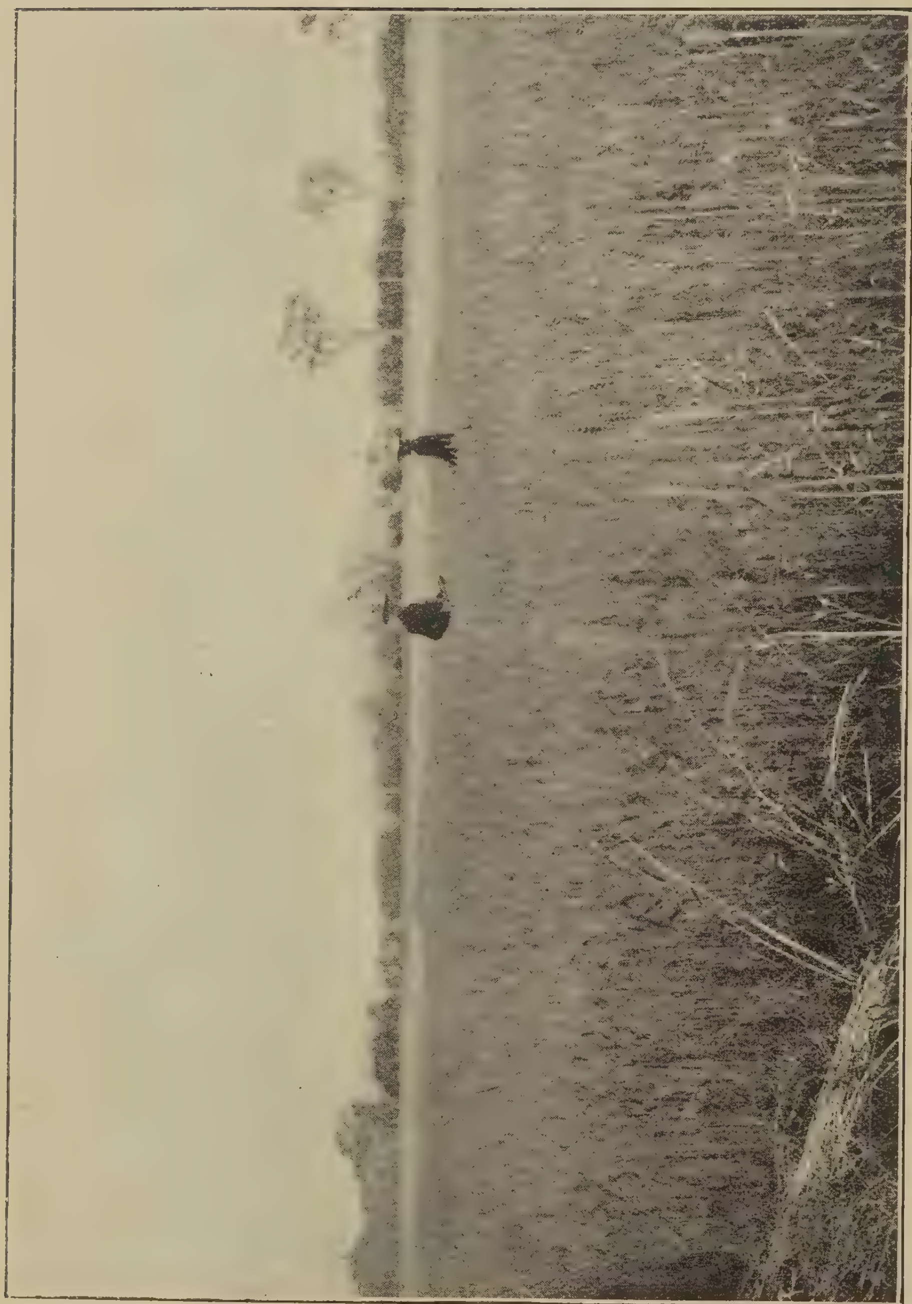

PLATE 11.—THE FODDER CROP OF FLORENCE WHEAT ON MR. A. COLLINS'S FARM, MARLBOROUGH.

PLATE 12.—GENERAL VIEW OF FLORENCE WHEAT CROP AT MARLBOROUGH.

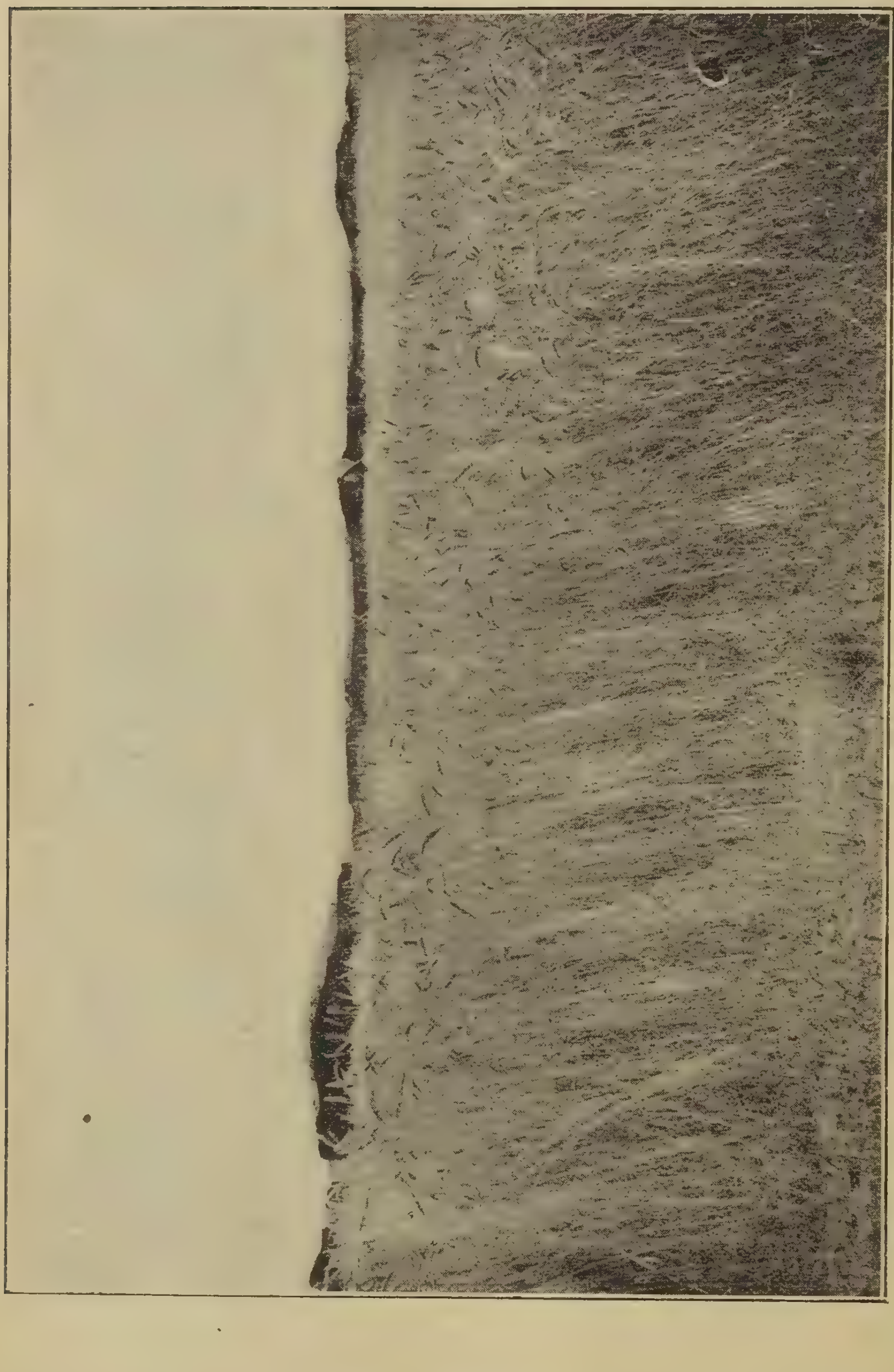

PLATE 13.—CROP OF FLORENCE WHEAT ON MR. LARSEN'S FARM, MIRIAM VALE.

"The tests carried out created a large amount of interest in the districts in which they were located, the plots being visited by numerous farmers, many of whom travelled a considerable distance to do so.

"The yields obtained at the respective centres are attached herewith.

"G. B. BROOKS,
"Instructor in Agriculture."

CENTRAL DISTRICT.

WINTER FODDER DEMONSTRATION PLOTS, SEASON 1920.

Results showing Yields in Tons per Acre (Green Weight).

Variety.	S. Larson, Miriam Vale.	J. C. Hales, Rosedale.	A. Collins, Marlborough	W. Hunt, Milyando.	Average.
	Tons.	Tons.	Tons.	Tons.	Tons.
Skinless Barley	14·7	9·1	11·0	5·5	11·6
Field Peas and Wheat ..	12·9	10·0	11·5	5·6	11·4
Cape Barley	10·2	14·0	9·4	6·9	11·2
Ruakura Oats	15·6	7·4	10·8	6·1	11·2
Florence Wheat	12·3	8·5	11·0	5·3	10·6
Indian Pearl Wheat ..	12·8	10·6	9·5	..	10·9
Warden's Hay Wheat ..	13·2	6·5	11·2	..	10·3
Piastre Wheat	13·2	7·3	11·1	6·1	10·2
Cleveland Wheat	12·1	6·9	10·3	4·8	9·8
Algerian Oats	Rusted	5·5	Rusted	4·0	4·7
Canary Seed	Failed	20·0	Failed	Failed	..

TREATMENT OF FISTULA.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock, Department of Agriculture and Stock, Queensland.

When a fistula on withers is forming, it is customary to apply a blister, or hot fomentations. This on rare occasions appears to effect a cure, but in the majority of cases it hastens the swelling and brings it to a head. After it has broken, surgical treatment is required.

The next thing to find out is the direction and depth of the fistula. This is done by using a flexible probe, some 8 or 9 inches in length. Free drainage must now be given by opening along the full length of the probe, or if thought advisable an opening can be made at the lower part of probe, and a seton or tape or other material passed through and tied on the outside. A seton keeps the wound open and assists in draining the cavity, but the first method of opening up is generally found more satisfactory. Both sides of the withers should be opened if necessary, and any necrosed (dead) tissue removed. The top of withers should not be opened crossways—from side to side—because there is a ligament which runs along the middle line of shoulders from the head—if cut causes serious consequences.

The chief points to remember are: Free drainage, the removal of all dead tissue, and the prevention of pockets where pus can accumulate.

The following lotion should be used every third day on the fistula after it has been opened up, until four applications have been applied:—

Corrosive sublimate	½ oz.
Methylated spirit	1 pint.

This is best applied by soaking some cotton wool or other absorbent material with the lotion, then packing the saturated cotton wool in the fistula. This treatment can be repeated if necessary after 10 or 14 days' interval. Knives, probes, &c., should be thoroughly disinfected before using by placing them in boiling water, or some disinfectant such as carbolic acid, Condy's fluid, &c. Knives and other steel instruments should not be allowed to come in contact with the corrosive sublimate solution.

Pastoral.

A NEW CURE FOR FOOT AND MOUTH DISEASE.

A cable from Paris to the Brisbane ''Daily Mail'' lately stated that successful experiments have been made with a new vaccine discovered by Dr. Cepedo, which is claimed to cure foot and mouth disease in four days. Dr. Cepedo considers that the infection is of a streptococcic nature, and he hopes the new treatment will replace serum injections. The highest importance is attached to the discovery in view of the fact that the disease cost Europe over 1,200,000,000 francs since 1918.

On the subject of this disease, we have received a most exhaustive account of its ravages and the remedies to be adopted, in an article in ''The Popular Journal,'' entitled ''La Fiévre Aphteuse'' (Geneva). The following is a translation of that portion of the article pointing out what should be done in case the disease should make its appearance:—

Instead of encouraging the propagation of the disease by smearing the mucous membrane of each animal with the mucous; instead of administering purgatives as recommended by one person, or drastics advised by another; and instead of applying antiseptics more or less factitious, the following treatment should be adopted:—Help the elimination of the toxic matter by draining the cellular centres. Induce the defensive reaction of the organism by striving to minimise it by restoring deminerised cell by recalcinating it. After many years of incessant experimentalising, a scientific remedy has been discovered, which is absolutely efficacious and practical for preventing and curing foot and mouth disease. The anti-fever remedy which we present under the name of ''Zeol'' is an isopathic specific containing mild toxins. It retains its properties for an indefinite period, and undergoes no change at a temperature up to 60 degrees F.

This remedy contains no toxic substance. It may, therefore, be injected without any injurious result; of itself it is absolutely harmless.

Recent experiments have proved that animals affected by the disease which have been healed with Zeol and Aftolin have been cured in a few days. Further, that no cow, goat, or sheep has miscarried or lost its calf or lamb; that the diminution of milk amongst females attacked has only continued for a few days, and has again become normal in a week after treatment.

That, thanks to Aftolin, the sores and swelling never become spreading, deep, or painful, because from the moment they are combated they cicatrise and rapidly disappear, and the animals treated preventively have become immune.

We also find further information, apparently confirmatory of the discovery of a rapid vaccine cure for the disease, in the ''Journal de la Seciété Nationale des Agriculteurs de Belgique.'' Following is a note received by the above journal on this important discovery, from Mr. Belin, Director of the Biological Institute of Tours, France:—

''Mr. Belin is not unknown in the scientific world, in which on many occasions he has signalised himself by successful new discoveries. Furthermore, the results which he has published are not merely those of the laboratory, which are so often illusive when applied in practice, nor even the outcome of a few successful experiments, but they are those proved by clinical facts, recorded in various places, and watched by veterinary surgeons.

''VACCINATION AGAINST FOOT AND MOUTH DISEASE.

''Up to the present it was said to be impossible to find a vaccine which would combat the disease and prove a protection against it for the animals, resulting in immunity. All experiments so far have been unsuccessful, and those following the tracks of serotherapy have not resulted in anything better. Nevertheless, this vaccination is reliable. It can be accomplished; such is the plain fact, resulting from the experiments made by me at the Bacteriological Institute of Tours, and from its practical application carried out for some months on 60,000 cattle and pigs, and that in all parts of France.

''Furthermore, the vaccine employed is prepared in such a manner that, being injected into sick beasts, it effects a rapid and complete cure. I cannot now enlarge upon all the successes realised, and must be satisfied with enlarging somewhat on

two of them, which may serve as typical—one from the preventive, the other from the curative point of view—because they have been proven on a large number of cattle, and because they have been perfectly carried out and diagnosed. I will now indicate briefly some results obtained elsewhere.

"*Preventive Measures.*—In June and July the mortality amongst adult cattle in certain districts of Calvados amounted to 30 per cent., and in the case of calves to 80 per cent. It was under these extremely rigorous conditions that Mr. Amiat, veterinary surgeon at Fleury-Harcourt, applied my method of vaccination. The results were, as stated by him: 'I have vaccinated 1,400 cattle for prevention of an attack. Only 100 had the fever, and that in a mild form. None of the vaccinated animals which were not breeding showed any lesion, notwithstanding their proximity to the sick ones. A great number of those treated totally escaped infection. Amongst the adults the mortality fell from 30 per cent. to nil, and from 80 per cent. to 10 per cent. amongst the calves. By this means mammiferous foot and mouth disease is totally avoided. One hundred pigs have been vaccinated, and some of them accidentally drank some infected milk, but not one of them became infected.'

"It would be difficult to establish more clearly the existence of such an immunity as one could possibly desire.

"Everywhere in France the most reliable results have been attained, and well-known veterinary surgeons who have operated with this serum are mentioned as being loud in their praises of it.

"*Curative Measures.*—What may be expected from this vaccine in effecting cures of sick animals by its application on a large scale is clearly shown by Mr. Colin, veterinary surgeon (Mayenne). He treated 354 cattle, of which 99 were calves, with the curative serum. Out of all these, one cow died, and seven sucking calves. The rest of them recovered without any further treatment beyond two doses on the first day and one dose four days later."

The article of which the above is an extract gives several other instances of cures effected by this vaccine, where any other treatment has failed.

MOLASSES AS A FUEL.

The investigations of G. E. C. von Stietz into the possibilities of using molasses as a fuel in sugar factories have been described in *Arch: Suikerind*: 28, 1920. The main results are summarised in "Chemical Abstracts," August, 1920, and are briefly as follows:—

The burning of molasses mixed with megass does not give good results, because of the formation of a slag which chokes the furnace grates and prevents proper combustion. The potassium compounds present in the molasses, moreover, exist in an insoluble form in this slag, so that its value as a fertiliser is greatly reduced. If molasses is burnt alone, much furnace space must be provided because of the large amount of foam produced and the great bulk of carbon liberated.

The only way to use molasses by itself as a fuel is to preheat it so as to bring about carbonisation. A process is now being perfected in which the burning can be so regulated that either a dry char containing about 40 per cent. of ash, or a pure white ash is left. The ash amounts to 7 to 12 per cent. of the molasses. It is soluble in water to the extent of 15 to 30 per cent., and contains 30 to 50 per cent. of potassium oxide. The chief soluble potassium compounds actually present in it are the carbonate, the sulphate, the chloride, and the silicate. It would be a difficult matter to separate these compounds by fractional crystallisation because their solubilities are so nearly alike. Various methods, however, have been devised for their isolation and purification in chemical plants worked in conjunction with large sugar factories. Only 20 per cent. of the heat produced by burning molasses is needed in the manufacture of the potassium salts, the remaining heat being available for utilisation in the sugar factory.

Besides potassium compounds, the ash of burnt molasses contains compounds of calcium, magnesium, iron, and sodium. These include chlorides, phosphates, and silicates of the metals named. A part of the potassium compounds, and all of the compounds of calcium and magnesium, and also silica are quite insoluble.

The increasing importance of preventing all possible waste in the modern sugar factory should be a sufficient reason to cause sugar technologists to give serious attention to the results of investigations such as the above, and it is hoped that some method of utilising molasses in the way suggested will eventually be adopted in many of our large West Indian sugar factories.—"Agriculture News," Barbados.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1921.

The weather during January was appreciated by the birds. Nice showers and cooler weather were inducements to brace up, and the laying for the month was satisfactory, especially in the light section. During the last ten days the increased output was very noticeable. Constant broodiness is what cripples the tally of the heavy breeds at this time of year, and every care is taken to immediately place broodies in coops, as it takes so little to bring on a moult. Very few birds are moulting, and those doing so are mostly laying as well. Featherless heads are much in evidence now, and the majority have that hard, tight appearance that utility breeders like to see at this season of the year. The birds are eating splendidly. T. Hindley's "A" Black Orpington died from ovarian trouble, and Mrs. Kettle's Black Orpington in group pen from tuberculosis. The following are the individual records:—

Competitors.	Breed.	Jan.	Total.
	LIGHT BREEDS.		
*Geo. Trapp	White Leghorns	123	1,302
*Haden Poultry Farm	Do.	112	1,285
*O. W. J. Whitman	Do.	128	1,284
*J. M. Manson	Do.	118	1,246
*J. Newton	Do.	115	1,245
*Quinn's Post Poultry Farm	Do.	119	1,243
*N. A. Singer	Do.	128	1,236
*J. J. Davies	Do.	115	1,235
Geo. Lawson	Do.	106	1,233
*Dr. E. C. Jennings	Do.	125	1,232
*W. Becker	Do.	125	1,229
*L. G. Innes	Do.	132	1,218
Mrs. R. Hodge	Do.	138	1,204
*E. A. Smith	Do.	125	1,195
*T. Fanning	Do.	115	1,195
*J. H. Jones	Do.	111	1,171
*G. Williams	Do.	104	1,167
*H. Fraser	Do.	104	1,158
*W. and G. W. Hindes	Do.	111	1,156
*Mrs. L. Anderson	Do.	110	1,147
*B. Chester	Do.	111	1,140
*Thos. Taylor	Do.	125	1,134

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS—*continued.*			
*Mrs. L. Henderson	White Leghorns	113	1,117
S. L. Grenier	Do.	106	1,115
*S. McPherson	Do.	89	1,111
Thos. Eyre	Do.	114	1,092
*Range Poultry Farm	Do.	99	1,083
E. Chester	Do.	116	1,051
*S. W. Rooney	Do.	83	1,041
Avondale Poultry Farm	Do.	101	1,026
H. P. Clarke	Do.	113	1,018
C. Langbecker	Do.	117	1,012
S. Chapman	Do.	116	1,008
R. C. J. Turner	Do.	109	1,005
W. Morrissey	Do.	102	1,003
C. M. Pickering	Do.	113	981
H. A. Mason	Do.	126	980
C. H. Towers	Do.	100	945
C. A. Goos	Do.	110	926
W. D. Evans	Do.	73	919
A. J. Anderssen	Do.	82	900
Miss E. M. Ellis	Do. ... Withdrawn		583
HEAVY BREEDS.			
*R. Burns	Black Orpingtons	115	1,264
*A. Shanks	Do.	128	1,254
*E. F. Dennis	Do.	99	1,241
*R. Holmes	Do.	95	1,218
*A. Gaydon	Do.	113	1,187
*E. Morris	Do.	103	1,180
*D. Fulton	Do.	92	1,159
*J. Cornwell	Do.	110	1,127
H. M. Chaille	Do.	95	1,113
*W. Smith	Do.	84	1,109
*A. E. Walters	Do.	87	1,100
*E. Oakes	Do.	92	1,094
*T. Hindley	Do.	86	1,061
*R. B. Sparrow	Do.	107	1,058
Parisian Poultry Farm	Do.	101	1,053
Mrs. G. H. Kettle	Do.	112	1,049
J. E. Smith	Do.	97	1,049
R. C. Cole	Do.	97	1,015
G. Muir	Do.	110	1,012
*E. Stephenson	Do.	100	951
*J. E. Ferguson	Chinese Langshans	100	947
*Nobby Poultry Farm	Black Orpingtons	80	927
G. Flugge	Do.	97	840
Total	...	6,882	71,569

* Indicates that the pen is being single tested.

RESULTS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	223	218	233	203	223	202	1,302
Haden Poultry Farm	235	172	236	228	202	212	1,285
O. W. J. Whitman	205	201	235	216	193	234	1,284
J. M. Manson	191	216	225	215	206	193	1,246
J. Newton	229	201	217	153	222	223	1,245
Quinn's Post Poultry Farm	233	213	214	193	183	207	1,243
N. A. Singer	213	186	205	235	204	193	1,236
J. J. Davies	220	210	211	187	210	197	1,235
Dr. Jennings	164	235	194	193	210	236	1,232
W. Becker	217	207	225	203	178	199	1,229
L. G. Innes	158	201	213	226	226	194	1,218
E. A. Smith	201	170	219	196	199	210	1,195
T. Fanning	99	213	209	218	228	218	1,185
J. H. Jones	195	191	202	211	199	173	1,171
G. Williams	181	199	203	196	219	169	1,167
H. Fraser	150	199	212	208	204	185	1,158
W. and G. W. Hindes	177	202	169	210	198	200	1,156
Mrs Anderson	223	208	203	183	160	170	1,147
B. Chester	199	171	205	186	198	181	1,140
Thos. Taylor	215	195	158	207	182	177	1,134
Mrs. Henderson	164	187	197	179	204	186	1,117
S. McPherson	223	225	91	137	231	204	1,111
Range Poultry Farm	131	174	197	217	177	187	1,083
S. W. Rooney	153	158	202	148	186	194	1,041
HEAVY BREEDS.							
R. Burns	212	197	241	190	216	208	1,264
A. Shanks	177	223	196	247	174	237	1,254
E. F. Dennis	226	197	184	231	192	211	1,241
R. Holmes	189	206	204	200	219	200	1,218
A. Gaydon	195	244	201	169	160	218	1,187
E. Morris	203	198	206	164	207	202	1,180
D. Fulton	206	206	186	216	92	253	1,159
J. Cornwell	193	211	197	129	182	215	1,127
W. Smith	110	222	204	205	188	180	1,109
A. E. Walters	172	183	167	207	160	211	1,100
E. Oakes	173	223	177	102	201	218	1,094
T. Hindley	192	216	179	174	136	164	1,061
R. B. Sparrow	197	123	197	171	164	206	1,058
E. Stephenson	184	147	182	168	140	130	951
J. E. Ferguson	130	161	123	161	203	169	947
Nobby Poultry Farm	184	238	83	250	152	20	927

CUTHBERT POTTS,
Principal.

THE SICILIAN BUTTERCUP.

Sicily is the largest island in the Mediterranean and it belongs to Italy. Palermo is the capital and is a seaport, beautifully situated on the northern shore, surrounded by a fertile plain and enclosed by lofty hills. It was in a village just south of Palermo that some fifty years ago an Italian, Lorenzo Mattei, had a uniform flock of these fowls. An American in diplomatic service, James S. Dumaresq, chanced to see them and they appealed to him, not only on account of the large white eggs they laid, but because the little buff chicks with a brown stripe down their backs reminded him of American chipmunks. He was enthusiastic and enjoyed breeding the Sicilian Buttercups at his summer home in Italy. When

he returned to America he took an important part in introducing the Sicilian fowls. The breed took its name from the peculiar shape of the comb, the cup-shaped formation of which suggested a buttercup.

An advance is now being made in the general quality of the Buttercups. The comb characteristic, the clear breast in the female, and the sound red and black colour in the male, are features that are being perfected through selective breeding. The stock as we now have it is the foundation upon which to build the superstructure, it is the proper material for the breeder to take in hand to mould. It is useless to go back to the original source for further material, for on the island the peasants have made no attempt to maintain the essential characteristics of the breed. The question now is one of cultivation, of breeding to a high ideal.

Coming from the island of Sicily, in the Mediterranean, one might reasonably expect that the Buttercup should have a white lobe. All the other Mediterranean breeds have white earlobes, solid red disqualifying. We have seen Buttercup hens and pullets with earlobes that were all white, but the standard states the red should predominate in the earlobe, with the least possible admission of white. The red lobe is a race characteristic of the Asiatic breeds, the Leghorn, Andalusian, Ancona, Minorca, &c., which came from the shores of the Mediterranean, having white earlobes. That old Roman fowl, the Dorking, had white lobes until the infusion of Asiatic blood was made by English breeders. It is this unmistakable Asiatic blood that gives the Buttercup its comparatively docile nature. In the writings of breeders of the fowl we have noticed again and again reference to the fact of its tractability.

From the colour of its plumage one may see that the Buttercup is by nature a pencilled fowl. Judges may compare the colour of the male with that of the Golden-pencilled Hamburg male, but the colour of the hen is buff, not golden bay, and she is plain in breast and pencilled only on the back and wing bow. She presents a considerable contrast to the deep red colour of the male. The pencilling of the female's feathers is somewhat similar to that of the golden-pencilled Hamburg, but the black bar running across the feathers is usually broken in the centre. Each feather on the back and wing bow should have a crescentic tip of black. This adds uniqueness to the pattern of the feathering. The comb is the distinctive feature of the Buttercup. Its general form is concave or cup shaped, and all the way round it spreads out into points. The comb is divided into two parts, half circles that are joined at the base. In this centre extraneous growths are frequently found, also points that stand up like the stamens of a flower. These are not desirable. The combs of the Buttercups in the illustrations are smooth in the centre and practically ideal. Single combs that are merely split into two blades, being imperfect in the development of the corolla, are often found in the females. Such are usually too large and loose, frequently lopping, hence are decidedly objectionable.

The following is the standard which has been finally adopted:—Weight of cock, 5 to 6 lb.; weight of hen, 4 to 5 lb. These weights are low, the majority of specimens in both sexes being at least one or two pounds heavier. The head should be fairly broad, eye a bright bay, beak of moderate length and dark horn in colour. Neck of medium length, furnished with a full flowing hackle. Body long and oblong in shape, breast deep and fairly full and well rounded; back of moderate width, sloping and narrowing slightly towards the tail. Tail large and well furnished, and carried at an angle of about 45 degrees. In the cock the sickle feathers should be long and the tail well feathered with side hangers. Shanks should be willowy green and of only medium length; four toes only on each foot. Thighs comparatively short, set well apart and at about the middle of the body. Colour of male—Tail sickles and coverts a glossy black; flights black and brown, rest of the birds a deep red. Colour of female—Neck, golden buff; breast a light shade of buff, free from black markings. Back and wing bows light buff with black markings. Under colour in both sexes, slaty colour.—"Garden and Field," Adelaide, S.A.

The Orchard.

GRAFTING THE PAPAW.

Referring to a note on ''Grafting the Papaw'' which we published in the January issue of the Journal, a correspondent of ''Nickos,'' 15th January, who evidently believes that it cannot be done, is informed that it can and has been done successfully. The following is the method adopted in India, Jamaica, and elsewhere. The question has been decided in the affirmative by well-known scientific experimentors in the countries named:—

The usual method of propagating the papaw in Queensland is from seeds, but it has been shown that propagation by cuttings and by grafting is possible, and has been successfully done in India and in Jamaica.

The method of grafting the papaw is so extremely simple that it seems remarkable that it was not discovered earlier than in 1913. The writer discovered it before hearing of the successes achieved in the United States, and in the countries abovementioned. The grafted tree made astonishing growth.

The method adopted was as follows:—

The first difficulty lay in the fact that a bearing papaw tree under ordinary circumstances does not normally produce side-shoots which can be used for grafting. It has long been observed, however, that if the top of a bearing tree is cut, or broken off by accident, a large number of shoots begin to form, one from the upper part of each leaf scar—that is, the axil of the leaf. This takes place three or four weeks after the tree is decapitated. It is these small shoots, of which as many as fifty or more may be produced by a single tree, that are used in grafting the papaw.

One of these shoots is taken when a few inches long and about the diameter of a lead-pencil, is sharpened to a wedge point, the leaf-surface reduced, and then inserted in a cleft in a young seedling papaw plant which has been decapitated when 6 to 10 inches high, and split with a very sharp, thin, grafting knife. At this stage the trunk of the young seedling has not yet formed the hollow space in the centre. It is not necessary for the stock and the scion to be of equal size; the scion should not, however, be larger than the stock.

After inserting the scion, the stock is tied firmly, but not tightly, with a short piece of soft twine. The grafted plant should be shaded for a few days after the grafting has been done, and the twine should be removed on the sixth or seventh day. The best success has been secured by grafting potted seedlings in the bush-house or under the shade of a bath-house. Under these conditions fully 75 per cent. of success can be expected. The method has also been successfully followed in the field.

The Director of Fruit Culture, Mr. A. H. Benson, is, however, of the opinion that the grafting of the papaw would not be commercially profitable.—A. J. BOYD.

THE BANANA INDUSTRY: BUNCHY-TOP.

The Tweed River has long been noted for the excellence of its bananas, which always meet with a ready sale in the Southern States, and the advent of the disease known as ''bunchy top'' caused growers in the district much alarm as to its possible effects. In the ''Farmer and Settler,'' Sydney (Jan. 28), we read that experiments have recently been conducted by Mr. T. Brooks, of Highfields, Tweed Heads, in an effort to discover a cure for this disease of the banana.

The Assistant Fruit Expert at Murwillumbah (Mr. R. G. Bartlett) visited Mr. Brooks's farm lately, and expressed himself as being much impressed with what he saw. The treatment was first commenced on 21st December, and Mr. Bartlett is very hopeful that a preventive, if not a cure, has been found for this disease.

Mr. Brooks does not claim to cure ''bunchy-top'' when it has been long established, the treatment applying chiefly to newly planted suckers.

Mr. Bartlett states that after he visited Mr. Brooks's farm he inspected an area in which experiments were being conducted by another grower in a different district. The same chemical was being used, though in lesser quantities, but the results obtained by Mr. Brooks were corroborated.

Mr. Brooks intends to give the growers the benefit of his experience.

On this subject, the Brisbane "Daily Mail" writes:—

"If the new sulphur treatment, announced by Mr. T. Brooks, for ridding banana trees of the bunchy top pest, should ultimately prove to be generally efficacious, it may mean the saving of a great Australian industry. It has been stated that, failing some such cure, it could only be a matter of two or three years before all our banana plantations were utterly destroyed. Mr. Brooks, who as a banana grower, has himself experienced the bunchy top menace, believes that he has at last found a way to stop its alarming depredations. Having experimentally ascertained that bunchy top was caused by the action of a certain fungus which parasitically dwelt at the banana roots and thus starved the whole tree, his next problem was to discover a germicide that would scotch the parasite without injuring the tree. He found that sulphur would exterminate any fungi; and so rapid and radical was its curative action upon the diseased banana plant that, a couple of days after it had been rubbed into the bulb, the yellow of the sulphur was visible in the top leaves. It is, of course, difficult to cure an old plant; and his advice in that case is to knock out the old tree, treat the hole, and then let the healthy suckers come on. It is to be hoped that the Department will follow up this bit of private research, and, by testing the scheme in various districts, find out to what extent it is a reliable remedy."

CANARY SEED.

MARKETING PROBLEM.

On 31st December a meeting of canary seed growers was held in the Nobby School of Arts. In addition to a large attendance of local growers, representatives were present from Pittsworth, Broxburn, Felton, and Greenmount, and Messrs. J. H. Cecil Roberts, M.L.A., and H. M. Hart, of the Wheat Board.

Mr. D. R. Edwards, who presided, mentioned that he had had a large number of letters from different centres, including Tamworth, N.S.W., all commending the movement for reasonable price for canary seed. He had interviewed Mr. Morgan, chairman of the Queensland Wheat Pool, and Mr. Morgan, whilst in Melbourne, had placed the matter before the Federal authorities and had been successful in securing considerable information. He had considerable information from Southern buyers which pointed to the determination of the buyers not to purchase to any great extent at the present time, as the position appeared critical. There were stocks in hand, sufficient at the present time at least, which had cost somewhere in the vicinity of £65 a ton. After these stocks had been disposed of the buyers would then operate at as low a price as possible, and would then average up their operations at the cost of the growers. Financial stringency was going to play a big part in the buying of the crop. The idea seemed to be prevalent that a very heavy crop was being harvested. He, however, thought the crop most disappointing and not nearly as heavy as anticipated. Correspondence from large firms in Melbourne, Sydney, and elsewhere showed a desire to get the farmer to mention a price at which he would sell. He advised growers to make an effort to fix a price based at such a figure as to be a payable proposition.

Letters were read from New South Wales advising farmers to hold on to their crops until February, by which time the high-priced canary seed would in all probability have been disposed of. Some co-operative method of selling must be evolved either through a compulsory or voluntary pool.

The most difficult question was finance, but, like all other difficulties, this would have to be faced and overcome.

The chairman then announced a scheme for the meeting to consider. The meeting was asked to form an executive committee to deal with the situation. This suggestion was adopted, and the following were appointed an executive committee:—Messrs. Edwards (Nobby), Fitzgerald (Felton), Denning (Pittsworth), Hogg (Greenmount), and Cornford (Broxburn).

The scheme provided for taking immediate steps to ascertain as near as possible the stocks held, the crop available, and the requirements for twelve months. This would enable the committee to decide upon what amount of seed, if any, was available for export. Steps would then be taken towards the formation of a pool to deal with the matter co-operatively.

The cost of pooling was important. In a subsequent discussion on this matter the chairman pointed out that farmers did not realise that the speculators who financed and buyers who handled crops did so at an actual indirect cost, which was far in excess of what any ordinary pool would cost.

Steps are now being taken to secure the necessary information with a view of enabling growers to take concerted action in their own interests instead of, as in the past, selling one against another.—"Daily Mail."

Apiculture.

GENERAL INFORMATION AND HINTS TO AMATEURS ABOUT TO START BEEKEEPING.

By W. F. LYON.

So many requests have been received by the Queensland Beekeepers' Association for information as to how to start beekeeping and the initial cost, that the association came to the conclusion that it would be a good thing to have a pamphlet printed for the benefit of new beginners, and it was decided that Mr. W. F. Lyon approach the Department of Agriculture to see if they had any pamphlets printed for that purpose. On inquiry it was found that no such pamphlet had been issued by the Department.*

As I have had fifty-six years' experience in beekeeping, I should know enough about it to affirm that any person taking up beekeeping as a hobby would never regret it, provided he does not neglect the bees. The question of profit depends almost entirely on the knowledge, energy, and perseverance of the beekeeper. If he gives the bees proper attention, they can generally be depended upon to do their share of the work.

In the first place, I would say to the beginner: "Is your locality suitable for bees?" Don't think for a moment that bees make honey. They gather it, and if it does not grow within 2 miles of where you want to keep bees, I say do not attempt it, as it will be a failure. Don't think that a few flowers growing in your garden are sufficient to supply them, because they will not do so. You must be near a eucalyptus forest, or near a locality where there is plenty of lucerne grown. If any new beginner wants to start beekeeping for a livelihood, he should be very careful to start in a suitable place, as many have failed through neglect of this precaution. Always apply to an experienced beekeeper for advice before starting an apiary. My advice is to keep away from all scrubs and tea-tree swamps, as they produce a very inferior honey which will spoil the sale of your product. If you have not the means to buy a quantity of colonies to start with, be very careful how you increase your stock, or you will only be courting failure again. If the colonies are divided into two or three parts, they get down so low that they cannot recover themselves, and you are sure to lose the whole of them, unless you have other colonies to support them with honey and brood. To work a bar-frame hive for profit, it is first necessary that the beekeeper should exercise forethought and be prepared for any emergency that may arise. He should always have by him plenty of spare frames, foundation combs, and supers. It is very unprofitable to be short of these essentials during an unexpected honey flow. The man who wants to keep only one or two colonies will require one full colony of Italian bees with super all complete, one smoker, one wire embedder, ¼ lb. of spool tinned wire, and one bee-veil. These will cost about £4 10s. He should have an uncapping knife and honey extractor, but these are rather expensive items at the present time, and can be got later on. If you are living in a small space of ground, you must take care not to place the hive too close to the fowlyard or the stable, as the bees have a great aversion to horses and fowls, and do not put them in the garden where you turn the soil up. Do not place the hive in a low, damp place, for if you do so it will cause mildew in the combs and be very unhealthy for the bees.

When you buy your colony of bees, get the owner to pack them for removal, as it wants an experienced person to do this properly to prevent the bees from suffocating or getting out. Having got the bees home, place the hive on the stand where you intend to keep it. Pull all the strips off all the sides that are holding the hive together. Now be very careful when pulling the tacks out of the netting that is nailed over the entrance, and be sure you do not let any bees out until you have all the tacks drawn, then pull the entrance off and run (but there, I needn't tell you that).

The bees will be very angry now, so you must keep away for five minutes. Have your smoker charged with a little rotten wood if possible and a few live coals. If you have no rotten wood, use the very small chips in your wood heap. Note:—When you lift the cover off, do not lift it off quickly. If it is sealed down with propolis, take a chisel or knife and prise the cover up, sufficiently to break the seal. Then lift one end of the cover a few inches with one hand and blow a little smoke with the other. If you do this carefully you will never be stung by the bees on opening the hive. Be sure not to jar the hive in any way, as it makes the bees very angry.

Now choose the frame you are going to take out first. Push the frames on each side a little way so as to give more room to lift the selected frame out without crush-

* Exhaustive papers on the industry were published in the "Queensland Agricultural Journal" (vols. 1 to 19).

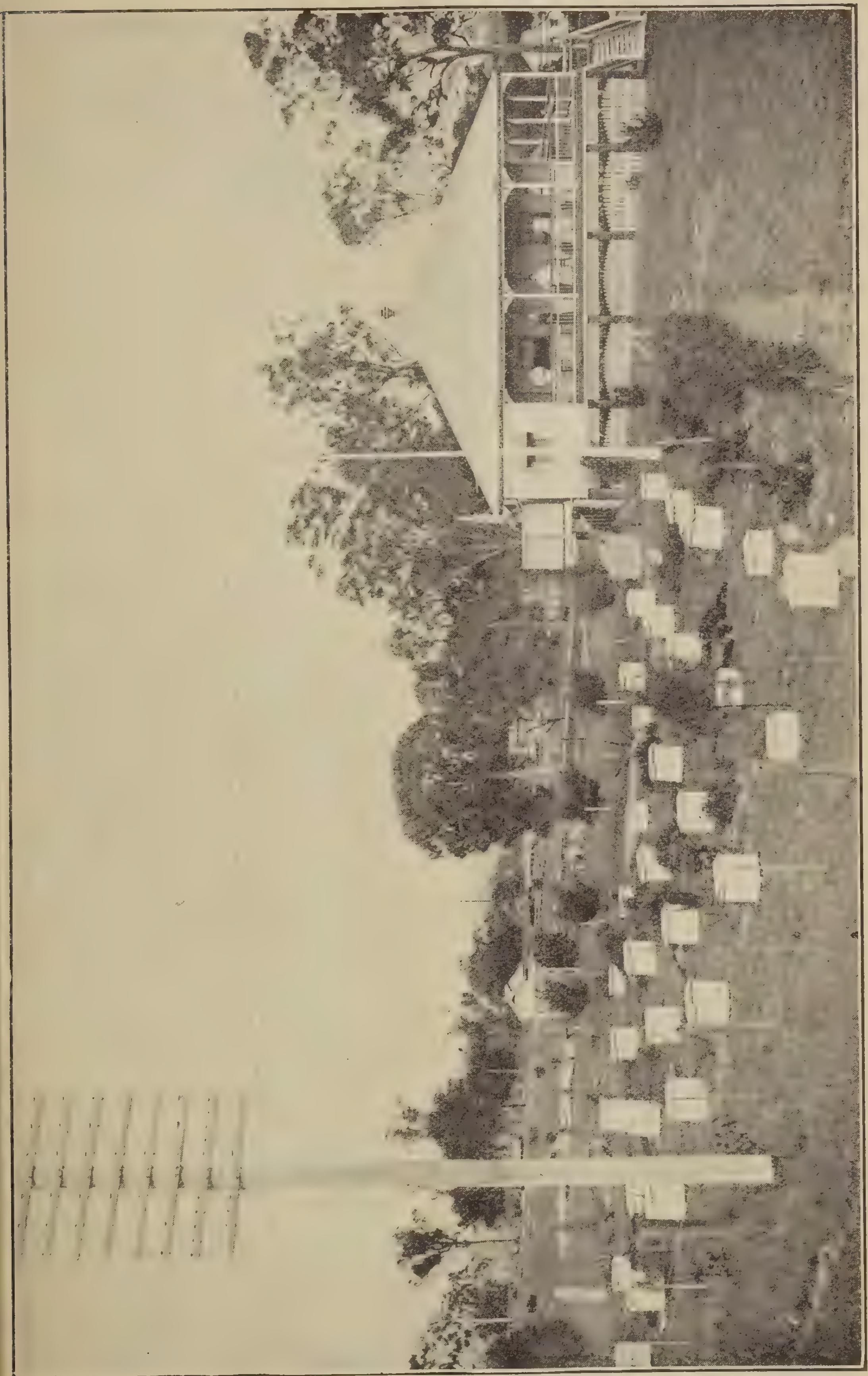

PLATE 14.—A BEEKEEPER'S HOME.

ing the bees. Place this frame on the opposite side of the hive, with one end on the ground. You will now have plenty of room to lift the others out to examine them.

When you want to lift the super off, use the same method as when lifting the cover off. It is better to leave the cover on the super until you have finished examining the brood combs. If you want good returns of honey, do not let your bees swarm. This can be done by giving them empty combs in the super as fast as they fill them. Examine the brood combs once a fortnight, and take off any queen cells that might be on the combs. You will know the queen cells when you see them, as they project out much further than the other brood and are of a thimble shape. The examination for queen cells is only necessary between the months of September and the end of February. Remember that the more bees you can keep in the hive the more honey they will produce. Should you think they are overcrowded, place another super in the centre, with full foundation comb. This is not necessary unless there is a good flow of honey coming in.

The best plan is to have the queen's wing cut, so that if they swarm out at any time the bees will not go away without the queen. Look for the queen on the ground near the entrance, and when found, place her in a cage until the bees come back. I have for over twenty years used a tea ball for this purpose, and it is one of the handiest cages in the apiary for holding the queen at the time of swarming.

Should you want to make another swarm, remove the old hive to another place, then place the new hive where the old one stood, with foundation combs complete, which, of course, you should have ready. Then take one of the brood combs and place it in the new hive.

By this time the bees will be all coming back into the new hive, and you can now release the queen at the entrance and let her go in with the bees.

Now go back to the old hive, and cut out all the queen cells but one. On the sixth day after the swarming look into each hive to see if the queen is in the hives. If you cannot see the queen, and you think she is lost, put in another frame of brood with new-laid eggs, and if the queen is lost, they will make more queen cells immediately.

On the twelfth day after you have put the new eggs in, remove all the queen cells but one, and be sure not to leave any more than one cell, for if you do they will very likely swarm out and you might lose them. Generally speaking, the queen will hatch out on the fourteenth or fifteenth day.

You must on no account cut the virgin queen's wing. When you want to cut a queen's wing, take her into the house, shut the doors, and let her run about the table. Hold her between the finger and thumb (do not be afraid, she will not sting you unless you are squeezing the life out of her). Just clip a small piece off one wing. When returning her to the hive, give the bees a little smoke and let her go in from the top between the frames.

Should you want to go in for section-comb honey, it would be advisable to get one of the bee merchant's catalogues, which will give you all the information you may require.

There are many people that live in the "waybacks" who can get wild bees out of trees, who could thus start beekeeping with very little expense. Buy a single hive with frames; have half the frames filled with foundation comb, but do not wire the other half. Make fifty support hooks of this shape ⌐———¬ out of some small wire, and make them long enough to fit on the side of the frame. Now place four on one side of the frame, laying it on a board with the hooks on the under side. Place the brood comb you take out of the tree, or any box from which you would like to transfer, on top of the frame. Take a sharp knife and cut the comb all round the inside of the frame. If the comb is not large enough to fill in the frame, fit in small pieces to suit. Now place four hooks on top of the frame as it lies, lift the board up perpendicularly, take the frame away, and place it in the new hive. Three days afterwards you may take all the hooks off again, as the bees will have it all fastened in. Shake all the bees you can into the hive, then place the hive near where the swarm is, and the rest will go in with the help of a little smoke.

Should the queen be killed, the bees will make several queen cells, and another queen will hatch out on the fourteenth day.

Should the new beginner carry out these instructions, he will never regret he started beekeeping.

I have often been asked what is the best remedy for a bee-sting. My remedy has always been to put a little spittle on the place and blow the smoker on it.

Oxley Apiary, Oxley.

Every beekeeper should join the Beekeepers' Association, and also take the "Queensland Bee Journal." The subscription is only 5s. per annum for membership and journal. General meetings are held during August, November, February, and May in the Y.M.C.A. room, Edward street, Brisbane, at 8 p.m. Visitors are cordially invited to be present. The hon. secretary's address is—F. J. Glover, Riding road, Bulimba, Brisbane.

Dairying.

DIRECTIONS FOR TAKING SAMPLES OF MILK FOR TESTING, ETC.

BY E. GRAHAM, Dairy Expert, Department of Agriculture and Stock.

In taking the sample of milk the greatest care must be exercised, as upon this practically depends the value of testing.

As soon as the milk is drawn from the cows it should be weighed. A small spring balance is the most suitable for this. Immediately after weighing pour the milk from one bucket to another, and without delay take a small quantity with the ladle as supplied and pour into the sample bottle. The larger sized ladle is to be used for taking the morning sample, and the smaller sized ladle for taking the evening sample of milk.

The composite sample bottles as supplied contain a preservative, and must be kept securely corked after each sample is taken. Do not wash out the bottle before putting the milk in.

Write the name of the cow plainly in the column on the sheet supplied for that purpose, and attach the name of the animal to each sample bottle; then, as the cows are milked, mark the weight of milk below their names, and take the samples as above directed.

When the sample bottles are sufficiently full, they must be sent to the officer in charge of the testing in your district. The officer will furnish you with his address, and give such other information as you may require.

The weighing and recording of the weights of milk yielded by each animal shall be continued throughout the period of lactation. The taking of the composite samples will be done at intervals of about three months. The sample bottles will be periodically supplied by the testing officer.

As far as possible the testing officer will instruct dairy farmers in the practice of testing milk by the Babcock method.

In every instance the full complement of cows in profit in the herd must be entered by dairymen.

It is not intended that the testing officer will give results relative only to a few selected animals from each herd.

In a future issue of the "Agricultural Journal," I hope to furnish some of the actual results and other particulars connected with herd testing since the inception of the work in Queensland.

HAND REARING OF CALVES.

Hand rearing is adopted by most dairymen in order to procure the best monetary returns, but frequently the calf is the sufferer. A young animal requires natural food for the first few months; consequently, it cannot be expected to thrive and keep in good health when it is fed on separated milk, practically devoid of fat, and frequently more or less contaminated with dirt and its accompanying organisms.

It is most important, for the first two or three days after birth, to give the calf its mother's milk (colostrum); this acts as a natural laxative, which is essential to clear the bowels of fœtal deposits (meconium). Following the first few days the calf should be given about 2 pints of new milk three or four times daily, for at least four weeks, after which skim or separated milk can be given, which is mixed with other foods, such as oatmeal or linseed gruel, the latter making up for the abstracted fat. Usually, when the calf is six weeks old, it begins to pick grass or a little hay, but the skim milk and linseed should be continued until the calf is three or four months old, and always given at about the normal blood heat.

LINSEED JELLY.

Boil slowly, for three or four hours, 1 lb. of linseed in 3 quarts of water, so that about 2 quarts of jelly or thick fluid remains. Mix about 4 oz. with the separated milk at each meal. Increase quantity as required.

OATMEAL GRUEL.

Mix 1 lb. of oatmeal in 1 gallon of cold water, and then boil; keep well stirred; then allow to simmer over a slow fire until it becomes thick. Allow 4 to 6 oz. with separated milk at each meal.

Tropical Industries.

THE CANE CROPS IN THE BUNDABERG DISTRICT.

A SATISFACTORY OUTLOOK.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

"During the month the canegrowing areas of Bundaberg (Sharon, Gooburrum, and Oakwood), Bucca, Avondale, Bingera, and Gin Gin have been visited.

"SHARON, GOOBURRUM, AND OAKWOOD.

"The outlook on these places is distinctly pleasing for the coming season. The recent steady rains have done good work, and the plant cane, especially the Autumn planting, is making vigorous growth. The red scrub loams are responding more rapidly than the forest soils, the latter in many cases being badly in need of renewing, owing, in some cases, to its having been worked out, and in other instances to its being naturally deficient in plant food properties. Filter press cake is a useful commodity on the latter class of soil. Large quantities are required, however, before the result of using is noticeable. Mr. Dawson, a Gooburrum grower, got excellent results on a patch of forest loam by using about 16 tons per acre of filter press cake. The cane supplied, a last March D.1135 plant crop, is probably one of the best in the district.

"Speaking of varieties, D.1135 is still principally grown on these areas, although down on the river banks below Sharon, 1900 Seedling is making a splendid showing.

"There is a disease noticed by the farmers on these areas that they call 'bleeding.' After the cane has been cut, a considerable amount of fermentation takes place on the stool from which the cane was removed. It is a heavy, sticky fluid, and oozes up in fair quantities.

"The cane on Oakwood is looking well. The growers here would be well advised to thoroughly lime and green-manure as soon as they possibly can. The soil is not rich in organic matter and the reaction is acid. Nevertheless it is good farming land, and could be built up to an excellent cane growing standard. Deep cultivation is also very essential on this area.

"BINGERA AND BUCCA.

"Owing to wet weather and the sticky condition of the roads, some time was lost inspecting these places. The Bucca highways are notoriously bad, and the people in such a prosperous district deserve a better fate. With regard to Bingera, good rains have recently fallen, and the prospects are excellent. The plant cane is well advanced, and looks healthy, both Autumn and Spring. The farms are well cultivated, and judging by the excellent tilth obtained and the precision of drilling and general layout of the holdings, the growers this year are making big efforts to get the best returns possible in the future. It is too soon yet to estimate, even roughly, what the cutting will be like, but it would probably be a good guess to say that everybody connected with the industry will be well satisfied. At Bucca conditions look more promising than they have done for years. The country looks a picture, and the cane is making great growth. More land is being cleared and planted, and the cane-farmers are enthusiastic about their prospects. Lime is still required on the majority of the farms, also green manures. The roads, as previously mentioned, are bad, this being a considerable drawback, as the people have to depend on these for their transport to and from Bundaberg, there being no rail nearer than Avondale, and Bundaberg is the nearest market.

"With reference to varieties, D.1135 appears to be about the best. Others are Q.813, as yet just a few stools growing, 24A, Rappoe, and Mahona. Of these, the Q.813 appears to be easily the best, although there are only a few stools on Mr. Fisher's farm, but more of this variety could safely be planted. Mr. Moore and Nelson Bros. are growers who have a lot of cane in this year, which, judging by present appearances, should give them a big crop. Nelson Bros. are returned soldiers, and had to do much clearing after their repatriation, so that their farm reflects great credit on them. Live stock looks well at Bucca, and there is abundant grass. The Kolan River is high, and the springs on the flats are flowing.

"AVONDALE.

"This area also shows the effect of good rain, and most of the farms are already showing good crops of cane. The greater part of the cane is grown on the Plantation side, Mr. Alexander being about the only grower up the river who has any cane. He has about 15 acres. On the Avondale side, cane is still the principal product.

"Touching on varieties, M.1900, D.1135, Yuban, and Mahona are the principal canes grown. Yuban, which was planted extensively by Fairymead last year, is now being displaced by D.1135. It is not advisable for small farmers to plant the former variety. 1900 Seedling is looking well, and will probably give the grower the most profitable return. The cane is fairly free from disease here this year, and parasites, such as borers, are not causing much anxiety. The soil in many instances wants renewing, and with this end in view, as opportunity offers, the farmers should endeavour to plant cowpea or Mauritius bean extensively.

"GIN GIN AND MAROONDAN.

"The prospects on both these places look particularly bright. On all the Gin Gin sub-areas, Watawa, Currajong, Fairy Hills, and Wallaville the cane is doing well, and the mill should have a very fair crushing. There are dozens of growers that could be mentioned who are well satisfied, and justifiably so. The land is now in splendid order after the rain, and many farmers are busy preparing for the Autumn planting. Cane should pay well here in the future, if the long drought has properly broken, and growers would be well advised to devote the whole of their energies to cane production. Of the varieties that are mainly raised, 1900 Seedling and D.1135 (Fairymead) are doing about the best. Mr. Stollznow, a Currajong grower, has some cane on his place he calls 'Nerang,' but it is an early maturing variety known as H.Q.285, given out by the Sugar Experiment Stations some years ago. It is a good cane, and making a fine showing on his farm.

"With regard to Fairy Hills, a feature of this place is the quantity of limestone available for burning. Right in the centre of the cane area, and handy to other centres where lime is needed, it really ought to be exploited.

"At Maroondan, probably the best crops of 1900 Seedling south of the tropic are to be seen. This district should give a heavy yield of cane next season. The soil is in splendid condition, and the good growing weather is fairly making the cane move along. A feature of this place is the high sugar content of the cane. Messrs. Sondergeld Bros., who, in common with other farmers, suffered with the drought, have managed to get a heavy crop of cowpea turned in, and judging by the present condition of the soil, should find they have been well paid for their trouble. The roads are bad round Maroondan, especially since the heavy rain."

RATS EATING MATCHES NOT A CAUSE OF FIRE.

ELABORATE EXPERIMENTS PROVE THEY WOULD RATHER STARVE THAN EAT MATCH HEADS.

In the lengthy category of reasons and excuses for fires, that of friction due to the gnawing of match heads by rats and mice has had to bear its full share. When all else could prove an alibi the rats were blamed. The increasing number of fires attributed to this cause emphasised the necessity of establishing the possibility of its being bonâ fide.

The Underwriters' Laboratories, Inc., of Chicago, after careful and prolonged experiments by its fire prevention engineers, has reached the definite conclusion that rats would rather starve to death than eat the modern match heads.

This conclusion was arrived at through a series of elaborate tests, covering a period of eight months and more, in which numbers of rats were placed in enclosures with boxes of matches arranged so that they could reach them. The first test was made without feeding or watering the rats; in the second they were given water, but no food; and in the third they were given food and water for two weeks and then starved, but supplied with water until they died. Occasionally the strawboard boxes were gnawed and the boxes broken open and matches scattered all around, but although frequently the rats ate one another, in no case were the match heads gnawed nor was there any apparent danger of ignition.

With this positive evidence in their possession, investigators of fires will view with greater suspicion a fire which can be attributed to no other cause than that of rats gnawing matches.—"Conservation," Ottawa, Canada.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

BY C. T. WHITE, F.L.S., Government Botanist.

No 20.

STARR BURR (Acanthospermum hispidum, DC).

The Star Burr (*Acanthospermum hispidum*) has lately been gazetted a noxious weed throughout the State, and as several requests for a description and illustration of the plant have been received from shire councils and others, the following description has been prepared to aid in the weed's identification:—

Description.—A branching annual, 2 to 3 feet high, the branches and leaves covered with rough hairs. Leaves opposite, from under 1 to over 2 inches long. Flower heads solitary and sessile in the axils of the leaves. Achenes 10 to 15. Each achene when ripe is 2 to 3 lines long, oblong in shape, and narrower at the base than at the top; the whole surface covered with short hooked spines and crowned at the apex with two slender hooked spines, one on each side, and about 2 lines long; the ripe achenes are arranged in groups of 5 to 10, and radiate outwards in the form of a star.

Distribution.—A native of Central and Southern Brazil; was first recorded as naturalised in Queensland by the late F. M. Bailey in 1904 (*vide* this Journal, vol. XV., p. 493). It is now one of the worst weed pests in Northern Queensland, and I have noticed odd plants as far south as the neighbourhood of Brisbane, but, so far, it has not manifested itself as a bad weed in the temperate parts of the State.

Botanical Name.—*Acanthospermum,* from Greek *akanthos,* a spine; *sperma,* a seed; in relation to the two sharp spines at the top of the achene (''seed''); *hispidum,* Latin, meaning rough, shaggy, prickly, or bristly.

Properties.—I cannot find recorded any use made of the plant in South America or elsewhere. It is not known to possess any harmful or poisonous properties. The prickly ''seeds,'' like those of the ''Noogoora burr'' and ''Bathurst burr,'' easily attach themselves to the coats of animals, and are thus widely distributed from one place to another.

Eradication.—As the plant is an annual, eradication should be attempted, if possible, by hand-pulling or hoe chipping before the plants have had time to ripen their seeds. Spraying with an arsenical weed-killing solution should prove satisfactory where the plants are growing thickly together and stock can be kept away from them.

GRAPE CROP, 1921.

Mr. C. Ross, Instructor in Fruit Culture, when visiting the Maranoa district, found the grape crops in splendid condition, and said that they were the best and heaviest produced for many years. Unfortunately, the growers are handicapped by the cost of transport to Brisbane and elsewhere, and by the losses sustained annually during transit. In consequence of these disabilities, very few western grapes have reached Brisbane this season, the growers finding it paid them better to sell to the local winemakers. Thus, grapes, which Mr. Ross describes as the best he had ever seen, have not found their way to Brisbane. The best results were from the Gordo-Blanco and Snow's Muscats. The returns were very heavy, some of the land under vines having yielded over 3 tons of fruit per acre. From one 5-acre block 1,600 gallons of wine were made. Messrs. Bassett and Sons (of Madeira fame), Roma, have 220 acres under vines, and the entire produce of this area goes to the wine press.

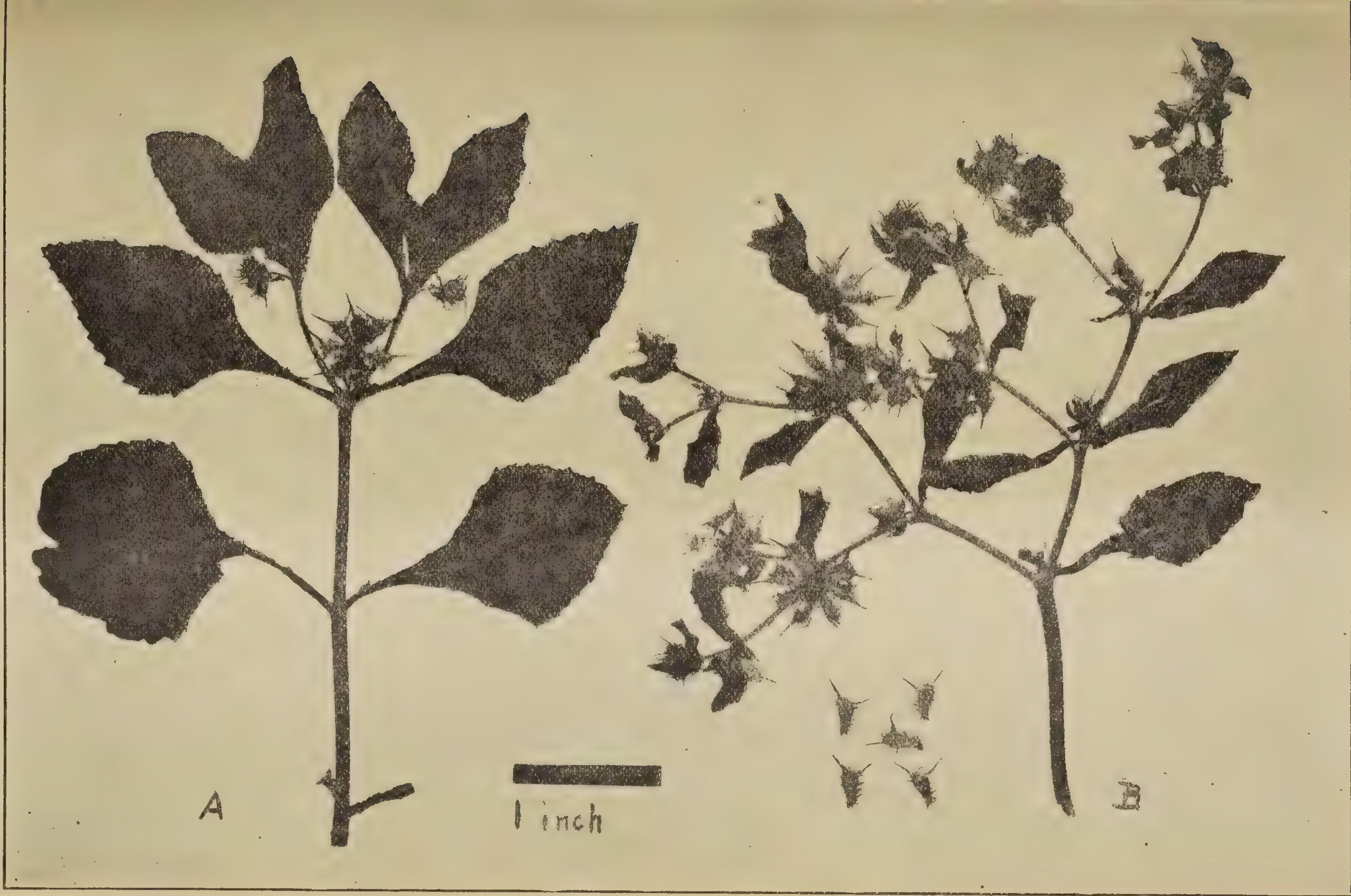

Plate 15.—Star Burr (*Acanthospermum hispidum*).

A.—Shoot from comparatively young vigorous plant just commencing to carry burrs.
B.—Shoot from an older plant, more branched, bearing smaller leaves and carrying numerous burrs. C.—Achemes or "seeds."

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon the Cane Grub Investigation, from the Entomologist, Dr. J. F. Illingworth:—

"The outlook for the next season's crop is most promising, for growing conditions are perfect, as far as climate is concerned. We must expect, however, considerable devastation from grubs in some of their favourite haunts. Greenhills, as usual, appears to be coming in for her full share. Fortunately, most of the several hundred acres of plant-cane on this estate was treated with arsenic, so that I hope for a thorough demonstration of the efficacy of this method of control. As mentioned last month, we can also hope for some immunity on certain of the ratoon fields, because of the removal of feeding trees along one side of the estate. Mr. Dodd and I have made material progress in a knowledge of the habits of the several species of cane beetles, in the field, by working early and late during the present flight. Since the end of November, it has been necessary to start observations by 5 a.m., keeping them up daily even through the holidays; and it is usually 9 p.m. before the work is completed for the day. Furthermore, these strenuous duties must be kept up for a few weeks longer, until the aerial life of these pests naturally comes to an end.

"AERIAL HABITS OF CANE BEETLES.

"*Lepidiota albohirta*.—We have now very definite information on these greyback beetles. Most important, perhaps, is that they are not satisfied with laying one set of eggs, for under normal conditions they continue this reproductive process as long as they are able to be on the wing. It has naturally been supposed that when they flew into the field and laid their eggs, they died. This is seldom the case, however, for we have clearly demonstrated that they return to the feeding trees and form a fresh set, though sometimes a smaller one, which they are usually able to bring to maturity. Again, as is well known, these beetles have two daily flights—morning and evening. We have found that the evening flight, between 7 and 8 o'clock, is primarily a mating flight, the beetles coming from the cane or from other feeding places, if they are already stationed in the trees, the males seeking out the receptive females. After 8 p.m. copulation ceases, and all of the beetles feed quietly until dawn. About 5 a.m. again there is activity in the camp, and the morning flight begins. In this they simply seek better locations among the foliage for the day; or in the case of females ready to oviposit, after circling a few times as if by instinct, they take a bee-line to a favourable location. I have seen them thus, between 5 and 5.30 a.m., coming into the cane in great numbers. At the latter time on clear mornings their flight ceases, and they settle on the cane leaves with their heads up; here they cling for a considerable period, perfectly motionless; and finally, as the rays of the sun begin to warm them up, they fall to the ground and usually crawl under the nearest stool, where they enter the soil. In doing so, the head works under any convenient object which is used as a fulcrum to assist them in getting in. Of the numerous specimens collected on the cane leaves at the termination of the morning flight, I have failed to find a single beetle that was not packed full of ripe eggs; and when they were given soil of the proper moisture, &c., they invariably laid at once, and soon reappeared on the surface, hungry and ready to start life all over again. Furthermore, we have demonstrated that the beetles make their first meal upon the cane leaves when they come out of the soil, both at the time of the original emergence from the pupal cell and after they have oviposited. They stay upon the cane leaves for the first day in each case; and during this period they usually eat out considerable notches in the leaf-blade, very similar to the destructive work of grasshoppers, cut-worms, &c.

"*Lepidiota frenchi* is second only in importance to the above, so we have given it special attention. This species, also, has the two daily flights, like the greybacks; they apparently differ from them, however, in being able to subsist entirely on the cane leaves, when other feeding plants are not available. This, undoubtedly, is largely due to the fact that they eat but little, compared with the greybacks; and their eggs are well developed when they first emerge. In fact, they are evidently able to lay within a week after coming out. Thus they have a considerable saving

of energy, which must naturally be expended by the larger species to form the eggs from the beginning, after the beetles appear above ground. On numerous occasions I have observed these beetles during the evening flight in cane areas far removed from any feeding trees. Under such circumstances, ignoring the financial aspect, the experience is most interesting. One waits expectant; everything is quiet, when, suddenly about 7 p.m., as dusk approaches, a seething horde appears out of the ground; everywhere there is apparent confusion as the myriads of beetles whirl to the right and left, frequently striking the cane leaves in their mad search for mates. After approximately ten minutes the flight is over, and all is quiet again, for the beetles have come to rest in pairs upon the leaves of the cane, or any other available object. About half-an-hour later, when it is getting quite dark, there is a second minor flight, composed largely of the males, which always fly away from their mates as soon as copulation is completed. After circling about for a brief period, they apparently again settle on the cane leaves, for both sexes can be found there in the early dawn. In fact, I have gathered quantities of them as they sat there quietly, all covered with dew, on the topmost leaves; under these conditions they appear cold and stiff, for they drop to the ground if the leaf is touched, making no attempt to fly away. Just preceding 5.30 a.m., when the morning flight starts, all the beetles begin to stretch themselves, moving their heads and legs; at the first signal hum, however, they are all off for a little exercise before going into the soil. It appears to be the habit of gravid females to settle on the ground at once, where they soon crawl under stools, and burrow in, to oviposit. The males, on the other hand, alight first on the leaves, and after a brief rest crawl down and enter the soil, but do not go so deep. Fortunately, this species is not yet addicted to a life in cane areas; they much prefer the open forest lands, with the numerous low bushes, among the grass. When such lands are cleared, however, and planted to cane, they have no recourse. Moreover, I do not know of a single case where they have moved from grass areas into cane lands that were formerly free from them.

"OVIPOSITING OF CANE BEETLES.

"*Lepidiota albohirta*, as we have always supposed, naturally lays her eggs at the base of the cane stools. Heretofore, however, we have had little field evidence on which to base this conclusion, other than that the resulting grubs are usually to be found there. This, apparently, is due to the fact that no one has gone deep enough in digging. I first placed a number of gravid beetles, collected from the cane in the morning, in a cage in the garden; and a few days later, excavated to locate the egg-chambers. I was considerably surprised, however, to find that they burrowed so deeply; the nine egg-chambers thus located varied in depth from 10 to 14 inches, with an average of twenty-six eggs each. With this information I was able to work more intelligently in the field. We dug two trenches in one of the old, abandoned, grub-infested fields at Greenhills; each trench was about 4 feet wide by 6 feet long, and 2 feet deep, two stools of cane being in each of these excavated areas. The results were most surprising; we found many tiny grubs in various sizes, up to a fortnight old, and twelve egg-chambers of the greyback beetles. These varied in depth from 8 to 18 inches, averaging 12½ inches; the clusters of eggs varied from 23 to 33 in a set, with an average of 28.2.

"*Anoplognathus boisduvali*.—In one of these trenches we also found a set of fifty-three newly-laid eggs of the Christmas beetle, which is also a troublesome pest of cane fields, and several grubs of this species in both the first and third stage. We also found an adult male beetle still in his pupal cell about 10 inches deep.

"*Lepidiota frenchi* was handled in much the same way that I did with the greybacks, placing a cage in the garden, and I found that they, too, go much deeper to oviposit than has been anticipated by former investigation. Furthermore, they do not lay all their eggs in one basket, as the greybacks do, but scatter them about in several parcels in the soil, each egg in its own tiny cell, the number varying from five to ten. They were placed at an average depth of about 8 in., in heavy clay soil. Later I found eggs in the field, under natural conditions, at a depth of about 10 in. This species lays on an average about thirty eggs for the first set, soon after emerging, and is evidently able to produce successfully a second set before succumbing. Hundreds of mating pairs may be seen almost any evening during the two months that they are on the wing. They are not at all particular where they hang up to copulate, for when numerous they hang on the wire fences, or, in fact, upon any object that presents itself. Recently I took fifteen pairs, hanging one couple upon another, on a small dry stick not more than 2 ft. high in an open field.

"*Anomala australasiae* is apparently much more rapid in development than any of the above; at any rate, some of the grubs had already reached the third stage by 16th December, just one month after the parent beetles were first observed on the wing. This small green beetle is becoming more and more abundant in cane areas,

and the grubs undoubtedly do considerable damage. The eggs are probably laid from time to time as they develop, for new sets are usually in a process of development in all the females dissected shortly after the primary emergence.

"*Lepidiota rothei* has not been much in evidence this season, though it has a one-year life-cycle, and has been very abundant in former years in the vicinity of this station. Evidently they have had a natural setback some way. Dissection would indicate that the eggs are not laid in regular sets; rather that they are deposited a few at a time, as the beetle enters the soil for its daily hibernation. Mating habits resemble those of the other *Lepidiota* in that the male hangs head downwards during copulation; but the period in this species is very short, lasting not more than two minutes.

"CONTROL MEASURES.

"*Hand picking.*—A few words on this subject may be of interest, for it may prove practical to gather the gravid female greybacks from the cane leaves after the morning flight, say from half-past 5 until about 8 o'clock. Every beetle so destroyed removes approximately twenty-six grubs from that stool of cane. When the flight is at its height it is possible for a man to gather a considerable quantity of the beetles in an hour or so by walking up and down the rows. If the cane is not too high one can see the beetles on a strip three or four rows wide. On the other hand, my investigation further emphasises the futility of collecting generally upon the feeding trees, especially if done more than two weeks after the primary emergence. In one lot that I gathered thus, I found that 86 per cent. were males, the remaining 14 per cent. being females that had laid their eggs and were empty. Possibly these females would develop more eggs, but this is questionable, especially late in the season. Nevertheless, a week later, when I dissected a collection of greybacks from Greenhills, I found an excess of females, indicating that the males had already begun to die off from old age, since they had been on the wing for six weeks or more. Furthermore, most of the females are now back at the feeding trees, in an endeavour to produce more eggs before they, too, succumb. *Natural enemies* are doing their share in the control of these pests. Muscardine fungus is still in evidence in the grub-infested fields at Greenhills, as demonstrated by our excavations there, for we frequently come upon its activities. It does not often appear to be effective in the destruction of the newly-hatched grubs, but I have recently noted the full-grown grubs of *Lepidiota frenchi* which had succumbed to this disease. The grub-infested areas always swarm with *Campsomeris* wasps; and I have recently found that several species of *Asilids,* also, frequent these fields, laying their clusters of eggs upon the leaves of the cane. The young are exceedingly numerous, and upon hatching drop to the ground and enter the soil in search of the young grubs about the stools. These tiny larvæ are very effective, once they locate the grubs, which are their natural prey. In my laboratory experiments with them they have already killed twelve young grubs in as many days. They burrow into the grub at any point, but preferably the back where they cannot be reached, and suck out the body juices. Apparently, they have some power to paralyze the grub, for it soon ceases activities when set upon. The beetles, too, have their enemies, which attack them while in the feeding trees throughout the day. Naturally many species of birds reap a harvest, and we are breeding out some new species of flies that attack them. Furthermore, Mr. Dodd recently found a most interesting bug, *Amyotea hamata,* about half-an-inch in length, which sets its beak into its prey and puts it out of action. When discovered, this bug had a full-sized greyback many times its own size, but the beetle was kicking his last. When the bug was put into a glass jar with another beetle it soon punctured it, right through the wing cover, and the beetle died. This predator would be most useful, if it would only appear in greater numbers."

DESTRUCTION OF NUT GRASS BY INSECTS.

VOLUME II., "Q.A.J.," PAGE 324.—DISCUSSION BY HUNTER RIVER AGRICULTURAL ASSOCIATION, N.S.W., 1898.

A Mr. Scobie had 3 acres of vines smothered with nut grass, but completely got rid of it. He ploughed the ground in the winter; then, whenever he found signs of living grass, he kept the scarifin going with knives 3 to 4 inches below the soil. If the ground got hard he ploughed again. That was done for two years, when it was entirely banished.

A Mr. Bishop mentioned a case where a 5-acre paddock was covered with nut grass. He sowed it thickly with imphee and then smothered it, but it took five years to do so.

AGRICULTURAL AND PASTORAL CONFERENCE AT GATTON COLLEGE, JUNE, 1899, PAGE 169.

Mr. W. Gibson, Bundaberg, said he had destroyed nut grass completely by pouring a few casks of molasses over it.

Mr. Booker (Woolaga) said that nut grass can be entirely destroyed by fencing it off and running pigs on the land.

Early in May, 1903, it was brought under the notice of the Department of Agriculture that in the Singleton district of New South Wales the notorious weed, nut grass, was dying through the attack of an insect parasite, some of which arrived in Queensland. But the Queensland Government Entomologist, Mr. H. Tryon, had anticipated the arrival of such consignments, and had taken steps to intercept them, in order to ascertain, before admission, the degree of probability of its attacking other plants besides nut grass. Until this question was settled, it was rightly considered most injudicious to establish this nut-grass-destroying insect in our State. Although the plant seeds, experience has shown that the pest is not propagated otherwise than from the nut and root.

There is one method for disposing of nut grass in a small garden, and that is to make borings into the clumps of the pest with a piece of gas-pipe, go well down, then fill the openings with salt, and water it well. This, if thoroughly done, will kill all the roots. But this also has its disadvantages in that it is not applicable to beds where other plants are expected to be grown, and present labour conditions make it too costly. Soda refuse from soapworks has the same effect.

A patch of nut grass was destroyed in the Acclimatisation Society's grounds at Bowen Bridge by placing a thick heap of strong new manure on the same. This, through the fermentation it undergoes, will kill any plant life that may be under it. This is, however, a lengthy and expensive application.

To come to the possible destructive powers of an insect, we find that in 1913 Mr. E. Jarvis, Assistant Government Entomologist, visited Bundaberg to study the economy of an insect which was said to be killing nut grass. This insect is named *Antonina australis* and was discovered on nut grass at Singleton, New South Wales, in 1903.

About the year 1910 Mr. F. L. Nott, of Bundaberg, obtained a bagful of infested grass roots, and pieces of this he planted in rows across the area to be treated, from 40 to 50 feet apart, and 20 feet from plant to plant, 3 inches below the soil, against the root of a flourishing clump of the weed. Operations were then suspended for a few months to allow the insects (coccids) to become established, and extend a few feet from the infected centres, after which the ground is ploughed and harrowed and planted with a cover-crop of lucerne, sugar-cane, or pasture. No cultivation is allowed until at least twelve months after the death of the grass tops.

Authorities are fairly well agreed that the danger of the insect attacking other plants is very slight.

The *Antonina* is closely related to the cochineal insect, and the latter will not touch allied plants of the same genus.

PROTECTION OF NATIVE BEARS AND OPOSSUMS.

The Minister for Agriculture and Stock desires to make it known that after a full consideration of all the surrounding circumstances the Government has decided to give protection to native bears and opossums for the remainder of this year and until the 30th April, 1922, at least. In other words, the close season will be extended to the date fixed by the Act in each year.

The Minister is quite aware that this decision will evoke objections from many who have different opinions concerning the question, but he wishes to make it known that during 1919 and 1920 the slaughter exceeded 5,250,000 opossums and 1,000,000 native bears (the latter were protected in 1920). These figures gathered by the Department, astounding as they are, do not by any means represent the total of the animals that were slaughtered, but they indicate only the number that were traced through the markets. Upon these figures alone it is evident that if our native animals are to be preserved from extinction some time must be allowed for breeding up, and it has been decided that this year shall be set apart for that purpose. Moreover, the skin market is not nearly so good as it has been during the last few years, and for this reason the present is an opportune time for protection.

Science.

EXPERIMENTS WITH CHLORINE IN DESTRUCTION OF FLYING FOXES.

The following report on the experiments made during the month of February by the Department of Agriculture, with the object of ascertaining the efficacy of chlorine gas in the destruction of flying foxes at Upper Coomera, has been forwarded to the Department by the officer in charge, Mr. F. L. Cheshire, who stated that the experiments show that chlorine is not a suitable gas for the work for the following reasons:—

(*a*) Gas too heavy, the great concentrations remaining at 20 feet and under, and if shot higher rapidly sinking.

(*b*) The gas which did penetrate to the foxes on the trees was apparently quickly irritating enough to make them take to wing before they suffered any real damage, and the camp in proximity to the gas remained on the wing until the gas had diluted so as to no longer be effective on them.

In regard to (*b*), when the cylinders were discharged a large number of the foxes took fright and took to the wing.

Of the ten cylinders of gas, eight were used, the screw-top of the other two snapping, and so they could not be turned on. The cylinders were used in two groups of three and four respectively (one cylinder was used separately for preliminary observation). The first group was intended to be five cylinders but for the screw-tops breaking.

One group was fired at 11 a.m. on the 9th February. The wind in this case veered back, but the result would not have been different.

The second group was fired at 7 a.m. on the 10th February. Both were ineffective.

The experiments, I think, go to show that both chlorine and phosgene can be disregarded in any future experiments on flying foxes; but it seems to me that the so-called "mustard gas" of the late war must be very favourably considered in regard to its chances of success in this work. There would be difficulties in adapting its use, which would have to receive special detailed consideration.

This gas would not require such elaborate precautions when using (from the general public standpoint) as with big volumes of chlorine or phosgene; but "mustard gas" is much more trying from the operator's standpoint.

Some points which make "mustard gas" very attractive for the present purposes are:—

1. Very great eye effect, and burning effects.
2. Remarkable persistency on account of slow evaporation of liquid and splashings.
3. Would not quickly irritate like chlorine or phosgene.

SYNTHETIC AMMONIA: A FRENCH INVENTION.

In its issue of 21st November, "Le Matin" published an article on the manufacture of synthetic ammonia, containing the following references to a recent French invention:—

"If the Germans were able to hold out for four years against the allies it was, above all, because they knew how to replace Chili nitrate, which could no longer

reach them, and which was the essential ingredient of their manures and their explosives, by other nitrogenous products which their chemical industry had successfully created from their very inception. It was because in the colossal works of the Badische Company they had succeeded in continuously manufacturing these bodies by the fixation of the nitrogen of the air with the Haber process. On this process, which almost succeeded in gaining them the victory, the Germans are counting for restoring their supremacy in peace.

"Now, facing the very efficient Haber process, a French process is to-day being perfected which is proving itself conspicuously superior to the German process, and which, provided the wings of its first essays at flight are not clipped, can and must to-morrow take from our enemies their present unchallenged supremacy in industrial chemistry. The inventor of this process is the young and known physicist, Georges Claude, the very same to whom France already owes the creation of the industry of liquid air. Yesterday, with a number of members of the Academy of Sciences, Messrs. d'Arsonval, Berthelot, Bigourdan, Janet, Lallemand, Moureu, Tisserand Lemoine, with several Ministers, Mr. Breton, who does not forget that he was Minister of Inventions, Mr. Reibel, and many other parliamentary leaders and experts (some are both), we were able to admire the ingenious invention of Mr. Georges Claude in full working.

"In the German Haber process the nitrogen from the air is fixed on hydrogen to form ammonia in tubes where the pressure is about 250 atmospheres. It was believed formerly that pressures of this order could not be exceeded without danger. Now Mr. Georges Claude—and this is the most essential feature of his invention—has proved that this is not the case, and that not only is it possible to produce pressures far in excess of these, but that they possess many advantages. The nitrogen from the air is separated by fractional distillation of the oxygen of the air after liquifying the latter, and it is a very curious thing to see these liquids, whose temperature approximates to 200 deg. C. below zero, flowing by the bucketful from an apparatus of quite modest dimensions. This nitrogen returned to the gaseous state is mixed in suitable proportions with hydrogen, and the mixture is compressed to 100 and then to about 200 atmospheres in ordinary compressors. Then they are taken into a new compressor, which compresses them to the astonishing pressure previously considered to be industrially impracticable of 900 atmospheres. How has this been rendered possible? Simply through the fact that the more the pressure on a mass of gas increases the more its volume diminishes, and consequently, the smaller the size of the apparatus becomes, the greater its resisting power and its staunchness will be. However this may be, whereas with the pressure of 200 atmospheres used with the German process, 10 to 12 per cent. at most of the gaseous mixture was converted into ammonia, this proportion is more than tripled with the high pressures of the Claude apparatus. It is in this respect, above all, as also because of the space occupied and of the far lower cost of the French plant, that its enormous advantages consist. It should be added that the high pressure permits the ammonia generated being collected wholly and directly in the liquid form—which the German process does not permit.

"At the present moment Mr. Georges Claude has already realised a daily output of a ton and a-half of ammonia, corresponding to 7 tons of sulphate of ammonia, and this with plant and works proportionately thirty times smaller than what would be required by the Badische for an equal output. On the other hand, it is not under the form of sulphate, but of chloride of ammonia, that Mr. Claude intends to furnish our farmers with the manure they require. This will permit of the chlorine being used, which is given off in large quantities in the industrial manufacture of soda—in short, this will permit of wedding the separate interests of these essential industries—soda and nitrogenous products. In comparison with these most powerful appliances of such small volume, the enormous German apparatus, with very indifferent efficiency and their 'colossal' complications, makes one think of the classical saying—the mountains were in labour and they brought forth a mouse."—"Planters' Chronicle" (Madras), January.

JAPAN PROHIBITS AUSTRALIAN FRUIT.

The "Fruit World" states that advice has been received from the Secretary of State for the Colonies that, with the object of preventing the introduction of codlin moth, Japan has prohibited the importation of Australian apples, pears, quinces, peaches, plums, apricots, and nuts.

General Notes.

TO MAKE OLIVE OIL AT HOME.

By C. H. BEAUMONT, Orchard Instructor.

Many people have a few olive trees. The quantity of fruit from them may not be considered enough to gather for the purpose of selling; they may, however, be of sufficient weight to make a supply of olive oil for home use. The process is a very simple one, and the appliances required may be found in most homes, with the exception of the crusher, and even that machine is often used by owners of fowls, for crushing dry bones for food for their fowls.

The olives should be ripe or nearly so; those which drop to the ground are not to be wasted. The olives need not be picked separately like fruit, but be stripped, either into a bag tied round the waist, or on to bags spread on the ground. The fruit may be kept spread out thinly for one or two weeks to wilt, or it may be at once crushed. Several machines in general use will do for crushing olives. The machine for crushing dry bone, or that for crushing corn, will do; in fact, any machine that is strong enough to break up the seed of the olive will be sufficient. For such a small plant about 10 lb. of olives at a time will be the quantity to use. Collect the crushed mass in a bowl or half-kerosene tin. It looks like a lot of wet linseed meal.

To get the oil it is necessary to have a number of pieces of canvas of the quality of a good sugar bag, and of the size of a 70-lb. bag. Lay a quantity of the crushed fruit in the centre of the canvas, about 1 in. thick, and over about one-third of the surface. Fold the sides over, then turn the ends over, and the mass is enclosed in the canvas, and is ready for the press. Seven or eight of such lots may be made ready, and can all be pressed at once. A press must be something with a solid foundation, and which can be worked up to a good pressure. A screw press will be best, but a press may be made by placing a good tray of a kerosene tin cut long ways on top of a strong table or on a flat log. Build the mats of the crushed fruit into the tray, being careful to have them level and even; put a clean board over the fruit mats. A lever must be made of a piece of timber or a sapling, say, 7 ft. long and about 4 in. by 3 in. One end of the lever must be fastened down to a tree or post, or be inserted into a hole in the wall. It will then be laid across the mats of fruit, and a gentle pressure exerted at the far end will cause the oil and water to come through. The pressure will be increased until the mats are almost dry.

The oil and black water are to be drained from the tray by a hole in the edge of the tray, from which it will run into basins or, preferably, into glass preserving jars, so that further operations may be watched easily. The dried pulp is taken from the mats and mixed with hot water, enough to make it of the same consistency as it was before pressing; it is again put into the mats and again pressed. The operation may be repeated at least three times. On examining the jars, the oil will be found on the top of the fruit juice and the added water, which is a nearly black colour, and is referred to as black water. The oil may be decanted, but it is easier to syphon off the black water by using a length of rubber tube with a short length of glass tube in the end. By this means it is easy to separate the oil from the black water, and this operation must be done as soon as possible after pressing; if left very long, the oil will take up the bitter flavour of the black water. The crude oil must now be filtered; perhaps twice, or maybe three times, to get it quite clear and bright.

A filter may be made of half a jam tin or similar vessel, by punching a number of small holes through the bottom with a nail; then lay carefully in the tin about 1 in. thick of cotton waste, which has been well teased out, or silk waste is better, but is more costly. Fix this filter over a basin and pour in the crude oil slowly. Filtering is the slowest part of the process, and several filters may be worked at one time. If some black water has come through with the oil, it must be separated by decanting. When the oil is clear it is ready for bottling. The bottles must be clean, and they must be dry before pouring the oil into them. Oil keeps better if stored away from the light.

For larger quantities of fruit the operation is the same, but special machinery is, of course, required. Different manufacturers use varying plants, especially for filtering quantities. Some bottle direct from the filter; others prefer to mature the oil before bottling.—"Journal of Agriculture of South Australia."

SOCIETIES, SHOW DATES ETC.

Allora.—Central Downs Agricultural and Horticultural Association. H. G. Deacon. Show dates: 16th and 17th February.

Atherton.—Atherton Tableland Agricultural Society. W. Morris, Secretary. Show dates, 18th and 19th May.

Ayr.—Lower Burdekin Pastoral, Agricultural, and Industrial Association. C. G. M. Boyce, Secretary. Show dates: 5th and 6th August.

Blackall.—Barcoo Pastoral Society. W. P. Tilden, Secretary. Show dates: 17th and 18th May.

Cairns.—Cairns Agricultural, Pastoral, and Mining Association. A. L. Nevitt, Secretary. Show dates: 8th and 9th June.

Charters Towers.—Towers Pastoral, Agricultural, and Mining Association. Show dates: 13th and 14th July. Geo. Urquhart, Secretary.

Crow's Nest.—Crow's Nest Agricultural, Horticultural, and Industrial Society. R. J. M. Collin, Secretary. Show dates: 15th and 16th April.

Gympie.—Gympie Agricultural, Mining, and Pastoral Society. F. W. Shepherd, Secretary. Show dates: 12th and 13th November.

Herberton.—Herberton Mining, Pastoral, and Agricultural Association. E. C. Wright, Secretary. Show dates: 28th and 29th March.

Ingham.—Herbert River Pastoral and Agricultural Association. J. A. Cartwright, Secretary. Show dates: 2nd and 3rd September.

Kandanga.—Mary Valley Agricultural, Horticultural, and Industrial Society. G. A. Ellis, Secretary. Show dates: 17th and 18th July.

Kingaroy.—Agricultural, Pastoral, and Industrial Society. E. T. Ambrose, Secretary. Show dates: 27th and 28th April.

Lockyer.—Agricultural and Industrial Society. F. Beckman, Secretary. Show dates: 13th and 14th July.

Maroochy.—Maroochy River Branch of the Queensland Farmers' Union. F. T. Latten, Secretary. Show dates: 20th and 21st February.

Mount Larcom.—Wilmott Farmers' Progress Association. J. J. Kelly, Secretary. Show date: 8th October.

Nanango.—Nanango Agricultural, Pastoral, and Mining Society. W. D. Darley, Secretary. Show dates: 20th and 21st March.

Roma.—Western Pastoral and Agricultural Association of Queensland. F. W. Mills, Secretary. Show dates: 17th and 18th May.

Southport.—Agricultural, Horticultural, and Industrial Society. E. Fass, Secretary. Show date: 26th September.

Wondai.—Wondai Agricultural, Pastoral, and Industrial Society. G. D. Griffith, secretary. Show dates: 4th and 5th May.

Woombye.—North Coast Agricultural and Horticultural Society. E. E. McNall, Secretary. Show dates: 15th and 16th June, 1921.

Zillmere.—Zillmere Agricultural, Horticultural, and Industrial Society. A. B. Marquis, Secretary. Show date: 10th September.

"ENGINEERING FOR LAND DRAINAGE," BY CHARLES HEATON ELLIOTT, C.E.

[Published by John Wiley and Sons, New York, and Chapman and Hall, London.]

This is another addition to the copious literature already existing on this subject; that it is appreciated, however, is proved by the fact that a third edition has become necessary, and a total of 11,000 copies have been printed. Much of the reliable information now to be obtained is found in large Engineering volumes too unwieldy to be of practical and immediate daily use. This volume is of compact and handy size, and really contains all that is necessary to be known on the various phases of the subject. While useful to the intelligent farmer or landowner, it is really intended for the professional man whose time is mainly occupied in such work. In newly-settled countries like Australia, where plenty of land is available for most purposes, ''land reclamation'' on a large scale is not so urgent as in older and more densely populated countries. Nevertheless, it is frequently found that there are large areas near the centres of population which require professional attention. The chapter on the ''development of land drainage'' gives an interesting résumé of the work already done in other countries. Other chapters deal strictly with technicalities and

are most useful to those intelligent farmers or landowners wishing to deal with their own lands, or to the professional drainage engineer entrusted with extensive works of this character.

The drainage of irrigated lands is ably dealt with, and as more land is brought under irrigation in this country it will be realised that a perfect system of underdrainage is as essential to success as a copious application to the surface.

The drainage of "house surroundings," such as lawns, gardens, orchards, stockyards, &c., forms a fitting conclusion to a subject of great interest to the general farmer, while the professional man who, unfortunately, in this country could not find sufficient demand for his services to require specialisation in this branch of work, will find it a handy volume for reference.

HORSE VALUES IN NEW SOUTH WALES.

Messrs. Bedford, Taylor, and Weston, Limited, the well-known Horse Salesmen of Wellington, New South Wales, report a most successful Horse Sale at their yards on 15th and 16th February, when 500 head were yarded to a good attendance of Buyers from Sydney and the Southern and Western Districts. The horses yarded were a good quality lot, and included the "Baratria" Station, Longreach, horses, which met with keen competition, realising up to £41 for Draughts and £17 for Light Horses. The market all round was good and solid throughout the sale, particularly for anything showing quality, which sold at much improved rates. Four hundred and eighty-four head were sold during the two days, best weighty Draughts making £30 to £41; medium and active sorts, £20 to £28; Light, £15 to £18; Growers, £10 to £20; Best Light Horses, to £17; Ponies, £8 to £17.

This firm will be holding big sales in March and April, and Owners having horses to dispose of should communicate with them, as they advise sending.*

Answers to Correspondents.

THE CULTIVATION OF RED CABBAGE.

All cabbages require a deep friable loam in which plenty of humus is available. If farmyard manure is applied, it should be well rotted and dug in at least two months prior to planting out.

Raise seedlings in a bed, and for this latter nothing equals compost. Sow the seed thinly in drills spaced 4 in. apart in the bed. Plants raised in this method are hardier than those sown broadcast.

Transplant when seedlings are 4 in. to 5 in. high, choosing cloudy and, if possible, showery weather. Plant in drills spaced 2 ft. 6 in. apart with plants 2 ft. apart in the rows. Keep down weed growths, and gradually hill up the plants during each cultivation.

If troubled with aphis, use strong tobacco solution; if cabbage moth, kerosene emulsion.

Sow from present month to May for red cabbage.

Varieties:—Red Drumhead, but, if procurable, preferably Red Zenith.

DESTRUCTION OF NUT GRASS.

"Poultry Farmer," Murarrie—

See article in this issue of the Journal on the subject.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY, 1921.

Article		FEBRUARY. Prices.
Bacon	lb.	1s. 4½d.
Barley	bush.	...
Bran	ton	£9 5s.
Broom Millet	,,	£27 to £32
Broom Millet (Sydney)	,,	£40 to £50
Butter (First Grade)	cwt.	238s.
Chaff, Lucerne	ton	£7 to £8 10s.
Chaff, Mixed	,,	£7 10s. to £8 10s.
Chaff, Oaten (Imported)	,,	...
Chaff, Oaten (Local)	,,	£7 10s. to £8 6s.
Chaff, Panicum	,,	£5 10s.
Chaff, Wheaten	,,	£5 10s. to £7
Cheese	lb.	1s. 2d.
Flour	ton	£19 17s. 6d,
Hams	lb.	1s. 8d. to 2s.
Hay, Lucerne	ton	£7 to £9
Hay, Oaten	,,	...
Honey (Nominally)	lb.	4¾d. to 5d.
Maize	bush.	4s. 10d. to 5s.
Oats	,,	3s.
Onions	ton	£6 to £10
Peanuts	lb.	6d. to 7d.
Pollard	ton	£10
Potatoes (English)	,,	£5 10s. to £10 5s.
Potatoes (Sweet)	,,	£2 10d. to £3 10d.
Pumpkins (Cattle)	,,	£2 10s. to £4 10s.
Eggs	doz.	1s. to 2s. 2d.
Fowls	per pair	4s. 6d. to 11s.
Ducks, English	,,	5s. 5d. to 6s. 6d.
Ducks, Muscovy	,,	7s. 6d. to 10s. 6d.
Geese	,,	10s. 6d. to 12s. 6d.
Turkeys (Hens)	,,	15s. to 20s.
Turkeys (Gobblers)	,,	25s. to 45s.
Wheat	bush.	8s. 9d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans (French), per sugar bag	2s. to 4s. 6d.
Beetroot, per dozen bundles	...
Cabbages, per dozen	4s. 6d. to 9s. 6d.
Carrots, per dozen bunches	1s. to 2s.
Cucumbers, per dozen	3d. to 1s. 6d.
Lettuce, per dozen	
Marrows, per dozen	1s. to 2s. 9d.
Peas, per sugar bag	8s. to 15s.
Potatoes (Sweet), per sugar bag	2s. 6d. to 3s. 6d.
Pumpkins (table), per doz.	1s. 6d. to 6s.
Rhubarb, per bundle	...
Tomatoes, per quarter case	2s. 6d. to 4s.
Tomatoes (inferior), per quarter case	...
Turnips (Swede), per cwt.	...

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Tweed River), per double case	...
Bananas (Queensland), per double case	10s. to 23s.
Bananas (Fiji), per double case	...
Cape Gooseberries, per case	...
Lemons, per bushel case	10s. to 15s.
Mandarins, per case	...
Oranges (common), per bushel case	...
Oranges (Navel), per bushel case	...
Passion Fruit, per half bushel case	5s. to 7s.
Pineapples (Queensland), per double case	6s. to 11s.
Pineapples (Queen's), per double case	6s. to 12s.
Pineapples (common), per double case	4s. to 7s.
Tomatoes (Queensland), per quarter case	8s. to 12s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel case	6s. to 12s.
Apples, Cooking, per bushel case	4s. to 7s.
Apricots (prime), per half-bushel case	2s. to 8s.
Bananas (Cavendish), per dozen	$3\frac{1}{2}$d. to $5\frac{1}{2}$d.
Bananas (Sugar), per dozen	2d. to 5d.
Bananas (Lady's Finger), second quality, per dozen	...
Cherries, per tray	12s. to 16s.
Cocoanuts, per sack	£1 5s.
Figs, per dozen boxes	3s. to 7s. 6d.
Lemons (Lisbon), per quarter case	3s. to 6s.
Mangoes, per bushel case	3s. to 8s. 5d.
Nectarines, per bushel case	2s. to 6s. 6d.
Oranges, per case	2s. to 3s.
Papaw Apples, per tray	2s. to 6s.
Passion Fruit, per half-bushel case	5s. to 10s. 6d.
Pears, per half-bushel case	8s. to 14s.
Peaches, per half-bushel case	3s. to 9s.
Persimmons, per half-bushel case	2s. to 5s.
Pineapples (smooth), per case	2s. 6d. to 4s.
Pineapples (rough), per case	1s. 6d. to 5s. 6d.
Pineapples (Ripley Queen), per case	...
Plums, per case	3s. to 6s. 6d.
Rockmelons, per dozen	1s. to 6s.
Tomatoes, per quarter case	2s. 6d. to 4s.
Water-melons, per dozen	1s. to 12s.
Grapes, per lb.	$2\frac{1}{2}$d. to 7d.

TOP PRICES, ENOGGERA YARDS, JANUARY, 1921.

Animal.	JANUARY. Prices.
Bullocks	£18 10s. to £22 17s. 6d.
,, (Single)	£30
Cows	£14 17s. 6d. to £16 10s.
Merino Wethers	30s. 6d.
Crossbred Wethers	30s. 9d.
Merino Ewes	21s. 9d.
Crossbred Ewes	30s. 9d.
Lambs	23s. 6d.
Pigs (Backfatters)	...
Pigs (Bacon)	...
Pigs (Porkers)	...

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will be ready for a first or second hilling up. The last of the maize will have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. Plant out paspalum roots, Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against blunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light, sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 in. high go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers, marrows, and pumpkins. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, pentstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March. Layers that have made sufficient roots should now be gradually severed from the plant, and left for a fortnight before potting, to ripen the young roots.

Orchard Notes for April.

THE SOUTHERN COAST DISTRICTS.

The gathering and marketing of citrus fruit, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March attention was drawn to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systemtic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th. After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry plantings may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

THE TROPICAL COAST DISTRICTS.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

THE SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as, even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. When citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and, when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1921.	Jan., 1920.
North Coast.	In.		In.	In.
Atherton	12·41	19	7·37	12·90
Cairns	16·94	38	15·65	18·64
Cardwell	17·13	48	12·44	25·67
Cooktown	14·87	44	33·67	9·41
Herberton	9·82	33	5·22	11·84
Ingham	16 88	28	15·39	13·99
Innisfail	23·96	39	18·19	13·73
Mossman	18·94	12	13·72	16·22
Townsville	11·91	49	5·75	11·71
Central Coast.				
Ayr	12·26	33	8·09	15·90
Bowen	10·37	49	6·99	19·24
Charters Towers ...	5·74	38	8·81	7·75
Mackay	15·21	49	15·91	20·41
Proserpine	18·48	17	14·96	17·17
St. Lawrence ...	9·75	49	18·30	22·11
South Coast.				
Biggenden	5·38	21	5·37	7·03
Bundaberg	9·19	37	7·41	11·37
Brisbane	6·42	68	4·04	11·86
Childers	7·87	25	5·52	12·27
Crohamhurst ...	13·02	25	12·41	21·11
Esk	5·47	33	3·96	11·69
Gayndah	4·81	49	4·94	5·63
Gympie	6·61	50	6·41	16·67
Glasshouse M'tains	8·60	12	8·38	16·04
Kilkivan	5·68	41	4·15	10·79
Maryborough ...	7·32	49	7·34	12·35
South Coast—continued:	In.		In.	In.
Nambour	8·93	24	9·18	22·32
Nanango	4·52	38	3·32	6·70
Rockhampton ...	9·18	33	4·67	11·58
Woodford	7·18	33	8·81	15·50
Darling Downs.				
Dalby	3·28	50	2·31	6·49
Emu Vale	3·22	24	0·83	3·23
Jimbour	3·76	32	3·21	5·01
Miles	3·90	35	2·42	4·52
Stanthorpe ...	3·62	47	1·07	2·53
Toowoomba ...	4·97	48	2·94	6·74
Warwick	3·59	33	1·25	4·44
Maranoa.				
Roma	3·48	46	1·41	1·66
State Farms, &c.				
Bungeworgorai ...	2·26	6	1·35	2·68
Gatton College ...	4·32	21	2·34	5·47
Gindie	4·03	21	3·12	4·33
Hermitage ...	2·79	14	1·83	5·54
Kairi	8·70	6	5·19	9 46
Sugar Experiment Station, Mackay	16 94	23	12·70	21·87
Warren	7·18	6	4·80	7·26

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET. AT BRISBANE.

1921.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·22	6·42	5·41	6·20	5·58	5·46
2	4·58	6·45	5·22	6·41	5·41	6·19	5·58	5·45
3	4·59	6·45	5·23	6·41	5·42	6·18	5·59	5·44
4	4·59	6·46	5·24	6·40	5·43	6·17	5·59	5·43
5	5·0	6·46	5·24	6·40	5·43	6·16	6·0	5·42
6	5·1	6·46	5·25	6·39	5·44	6·15	6·0	5·41
7	5·2	6·47	5·26	6·38	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·1	5·39
9	5·3	6·47	5·27	6·37	5·46	6·12	6·2	5·38
10	5·4	6·47	5·28	6·36	5·46	6·10	6·2	5·37
11	5·5	6·47	5·29	6·36	5·47	6·9	6·3	5·35
12	5·5	6·47	5·30	6·35	5·47	6·8	6·3	5·34
13	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
14	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
15	5·8	6·47	5·32	6·33	5·49	6·5	6·5	5·31
16	5·9	6·47	5·32	6·32	5·49	6·4	6·5	5·30
17	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·50	6·2	6·6	5·29
19	5·11	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·12	6·46	5·35	6·29	5·51	6·0	6·7	5·27
21	5·12	6·46	5·36	6·28	5·52	5·59	6·8	5·26
22	5·13	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·14	6·45	5·37	6·26	5·53	5·57	6·9	5·24
24	5·15	6·45	5·38	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5·54	5·55	6·10	5·22
26	5·16	6·44	5·39	6·23	5·54	5·53	6·10	5·21
27	5·17	6·44	5·40	6·22	5·55	5·52	6·11	5·20
28	5·18	6·44	5·40	6·21	5·55	5·51	6·11	5·20
29	5·19	6·43	...	...	5·56	5·50	6·12	5·19
30	5·20	6·43	...	...	5·56	5·49	6·12	5·18
31	5·21	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H. M.
9 Jan.	●	New Moon	3 27 p.m.
17 „	☾	First Quarter	4 31 p.m.
24 „	○	Full Moon	9 8 a.m.
31 „	☽	Last Quarter	6 2 a.m.

Apogee on 9th. Perigee on 23rd.

8 Feb.	●	New Moon	10 37 p.m.
16 „	☾	First Quarter	4 53 a.m.
22 „	○	Full Moon	7 33 p.m.

Apogee on 5th. Perigee on 21st.

1 Mar.	☽	Last Quarter	abt. m'night
10 „	●	New Moon	4 9 a.m.
17 „	☾	First Quarter	1 49 p.m.
24 „	○	Full Moon	6 19 a.m.
31 „	☽	Last Quarter	7 13 p.m.

Apogee on 5th. Perigee 21st.

8 Apr.	●	New Moon	7 5 p.m.
15 „	☾	First Quarter	8 12 p.m.
22 „	○	Full Moon	5 50 p.m.
30 „	☽	Last Quarter	2 9 p.m.

Apogee on 2nd and 30th. Perigee on 17th at 3 p.m.

ECLIPSES.

An Annular Eclipse of the Sun visible in North of Scotland but not in Australia will occur on April 8th.

An Eclipse of the Moon will occur on April 22nd, when the Moon will rise totally eclipsed.

The Planets Venus, Mars, and Uranus will be remarkably close together apparently on January 9th, and will form a fine celestial picture with the Moon on the 13th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Queensland.

Department of Agriculture and Stock.

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QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

THE IMPORTANCE OF AGRICULTURAL SHOWS.

The importance of shows in an agricultural country cannot be over-estimated. They not only give the farmer an incentive to improve his stock, but they supply him with a standard to work for, and, in addition, teach him the best methods to use to attain that standard. One thing the farmer has to learn is: That, as far as the production of milk-producing and meat-bearing animals is concerned, to stand still is to retrograde. There must be a continual search for improvement and progress; and the main direction of improvement for production, as well as breeding, will be along lines of increased application of scientific methods. No *progressive* farmer blessed with the normal amount of common sense can shut eyes to the fact that without the aid of science, especially as applied to machines, he cannot hope to secure a safe position. Milking machines, butter churns, cream separators, ploughs, planters, flax-scutching machinery, &c., have all been brought to such a standard of perfection that their non-use is not only unreasonable but blameworthy. The show affords progressive farmers an excellent opportunity of seeing and judging for themselves the best breeds to aim for—the best machines to get to help in increased production or to lower the working costs on the farm. The opportunity presents itself of examining to his own satisfaction—learning the costs of using and up-keep without risking a cent in advance. But shows play their own part as well. They cultivate rivalry and emulation; they are a real means of education in stock breeding; for no farmer, no matter how lackadaisical he might be, could look at the parading of fine stock without registering a vow that he would go one better next time, at the same time getting a better and more accurate knowledge of how to go about it.—''Farmers' Journal,'' Vol. 2, No. 49.

THE COTTON INDUSTRY.

The Brisbane ''Daily Mail'' for 11th March published the following cablegram from London which will doubtless prove of interest to Queensland cotton growers *in esse* and *in posse.* ''Replying, in the House of Commons, during the debate on international trade, to Mr. George Roberts, who emphasised the importance of strengthening the inter-imperial ties, and improving the cultivation of cotton in India and Africa, Sir Robert Horne pointed out that, in addition to manufacturers agreeing to pay 6d. per bale for cotton used in England, the Government had promised

£50,000 a year for five years to develop the cultivation of cotton in the Empire, and also proposed to improve the export credit scheme guaranteeing 85 per cent. of the merchants' selling price. He proposed to extend the scheme to the Dominions. He agreed that the Dominions should be placed first.'' This should open the eyes of Queensland farmers to the prospect of making this portion of the British Dominions a great cotton-growing country. The cultivation of cotton has, years ago, passed the experimental stage, for, during the American war, there were exported from Queensland to Great Britain 26,000,000 lb. of ginned cotton, worth £1,300,000, and had there been linting machines in use as there are to-day, this return would have been largely increased. For want of this machine, a vast quantity of short fibre remaining on the seed would have been removed, and could have been sold at that time for little less than the full price of cotton in the English market. The cleaned seed was thrown away as valueless, there being no oil mills in Australia, and 30,000,000 lb. of seed, valuable for its oil, then worth over £50,000, together with the oilcake, 2,600,000 lb., worth another £50,000—all went to the manure heap.

In those days the farmer obtained from 2½d. to 3d. per lb. for his cotton, and unless his crop was picked by the family, he paid ½d. per lb. for the work. The returns of a cotton crop are now greater than when any sort of seed was sown. The Department of Agriculture imported seed of the best and heaviest bearing varieties from America, with the result that one acre to-day produces half as much fibre again as the old varieties.

GROUND ALMOND—"CYPERUS ESCULENTUS."

G. B. BROOKS, Instructor in Agriculture.

In February, 1919, the writer was given a few nuts of the ground almond. This plant is a member of the Cyperus family, which also embraces the notorious weed nut grass (which is really a sedge and not a grass).

As the ground almond has a habit of growth similar to nut grass, it was decided to raise a number of plants, thereby ascertaining whether it was likely to become a pest under cultivation. Half a dozen tubers were, therefore, planted out in March. As this is a summer-growing crop, the season was really too far advanced for planting; consequently, the yield was light, each plant producing some two dozen small tubers or nuts. The best of those were selected for a further trial, planting in this instance being carried out in September, 1920; the soil being a brown friable loam. A quick germination resulted; the subsequent growth being also rapid, the plants stooling out in a remarkable manner and attaining a height of 2 ft. 6 in.

During the first week in February a stool was dug up and photographed, the soil first being carefully washed away, leaving only the tubers and fine fibrous roots. (See illustration.)

It will be noted from the photograph that the plant is a very prolific one. From the stool illustrated—which was grown from a single tuber—730 tubers or nuts were removed. Those are shown in illustration, Plate 17.

The tubers are attached to the plant by runners 2 to 3 inches long. When harvesting, a number of nuts are likely to be left in the soil, and, being small, are difficult to locate. Therefore, unless great care is taken in digging, the plant is likely to become a troublesome pest in cultivation.

The labour entailed in harvesting the crop, if raised for market purposes, would be both tedious and expensive.

The nuts, when dry, have a very agreeable flavour, but being somewhat fibrous cannot be masticated like the peanut.

The following extracts dealing with this plant, taken from the works of various authorities, are of interest:—

F. v. Mueller (in ''Select Extra Tropical Plants''):—''*Cyperus esculentus*. Habitat: Southern Europe, Western Asia, various parts of Africa. Produces the 'chufa' or ground almond, an edible root which contains about 27 per cent. starch, 17 per cent. oil, and 12 per cent. saccharine substance. Other (French) analyses give 28 per cent. oil, 29 per cent. starch, 14 per cent. sugar, 7 per cent. gum, and 14 per cent. cellulose. The plant does not spread injuriously like the *C. rotundus* (nut grass), and can be reared on sand land, though in rich soil the harvest is more plentiful. The tubers, of which as many as 100 to 150 may be obtained from each plant, are consumed either raw or cooked. Hogs root them up for food. The oil surpasses, in excellence of taste, all other oils used for culinary purposes. The tubers

PLATE 16.—GROUND ALMOND (*Cyperus Esculentus*).
Showing Crop of Tubes or Nuts.

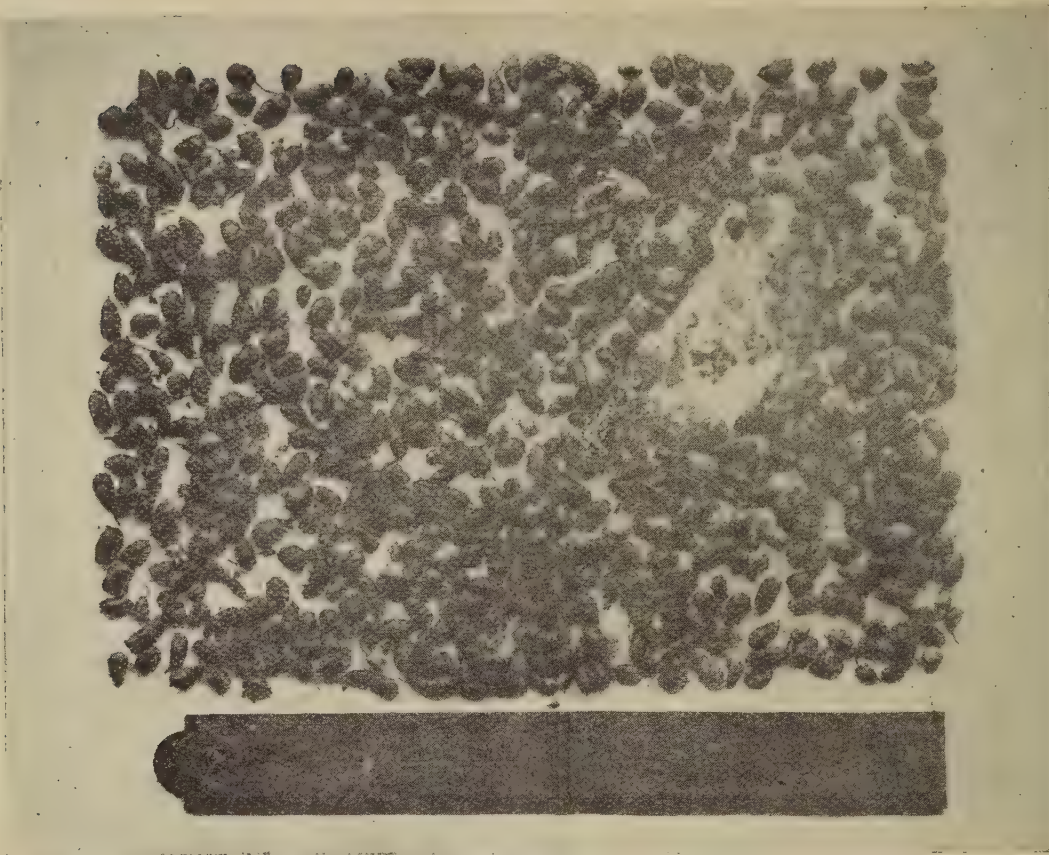


PLATE 17.—GROUND ALMONDS (*Cyperus Esculentus*).
Returns from one Stool or Plant.

are a fair substitute for coffee when properly roasted. The root crop is available in from four to six months. The plant may become important in the most dreary and arid desert countries through naturalisation. *C. esculentus* and *C. exaltatus* are used for mats.''

L. H. Bailey (''Cyclopedia of American Agriculture''):—''Chufa (*Cyperus esculentus*), sometimes known as earth almond. A perennial sedge that is frequently a noxious weed in low, damp places on Southern farms. It produces an abundance of small, cylindrical, underground tubers. The tubers or nuts are much relished by hogs. The hogs are generally turned on the field and allowed to harvest the crop. When cultivated, the nut has a fine flavour if properly dried. The crop does best on sandy soil that has been well fertilised. Heavy soils should be avoided. The rows are 2 ft. to 4 ft. apart, and the tubers set 12 in. to 15 in. apart in the row. The crop is recommended for fattening hogs.''

Dr. Lindley, in one of his botanical works, states that ''the roots of these plants (*Cyperus*) are succulent and filled with an agreeable and nutritive mucilage. The English species (*C. longus*) contains a bitter principle which gives its roots a tonic and stomachic quality. The tubers of *C. Hexastachys* are said to be successfully used in cases of cholera by Hindoo practitioners, who call the plant 'mootha.' Those of *C. Pertunnuis* are, when dried and pulverised, used by Indian ladies for scouring and perfuming their hair. The root of *C. odoratus* has a warm aromatic taste, and is given, in India, in infusions as a stomachic. The roots of some of the species are also used as an article of diet. *C. esculentus* yields tubers which are called by the French 'souchet comestible' or 'Amande de terre,' and are used as food in the South of Europe. According to Dr. Royle, they have been proposed as a substitute for coffee and cocoa when roasted.''

COTTON FROM NEW CALEDONIA.

In a letter from the Cotton Company of Havre on the subject of two shipments of cotton totalling 92 bales from Noumea, New Caledonia, for sale at the former port, published in the ''Revue Agricole'' (a publication issued by the New Caledonian

Chamber of Agriculture) last year, the following remarks on the classification of the shipments occur:—

"This lot is neither superior nor inferior to other arrivals of cotton from Noumea, but it shows a marked decrease in quality relatively to the lowest quality of that of preceding years. We attribute this falling off in quality—

(1) To the exhaustion of the soil, which is noted in all countries where cotton has been grown year after year in the same land.

(2) To the careless selection of the seed for resowing.

(3) To the fact that your planters allow the plants to remain too long without eradication and resowing. In Egypt cotton is resown every year. Your planters might, perhaps, leave their plants for two or three years in the same place; but they make a mistake, to the detriment of an average crop, when they allow the plants to occupy the ground for too long a period.

(4) To the increase in production in New Caledonia, and that, as a consequence, the means of ginning have not been sufficiently developed. The result is that the seed cotton awaits its turn at the ginnery for too long a time, and that, consequently, the oil from broken seeds discolours the fibre and gives rise to fermentation.

"We earnestly ask cotton planters to take serious note of the above observations. Our Caledonian type of cotton rightly is much appreciated by the buyers in the North of France, which is owing entirely to the specific qualities of its fibre, which are:—Length, strength, and elasticity. These are the qualities which must be maintained to ensure the high prices paid for it:—

(1) The cotton plant is an exhausting one, which especially requires potash. In the New Hebrides it is premature to talk of worn-out soils; but for New Caledonia the application of manure is absolutely necessary.

(2) All planters should be careful in their selection of seed. The wisest plan is to have some plants especially grown for seed purposes, and to choose the finest bolls, eliminating all badly-shaped capsules or any that show any defect.

(3) Our tree cottons should certainly not be retained indefinitely. They should be replaced in a very few years—as soon as they fail to yield abundantly.

(4) Our two ginning establishments are well equipped with machinery, and the reason for the cotton being often oil-stained appears to be that the farmers usually pack their crop in immense sacks placed under severe pressure, and the transport is charged at per sack instead of by weight.

"Many of these sacks sent to the gin-houses at Noumea contain up to 100 kilos (220 lb.) of cotton; and, to get that quantity into a sack, such forcible pressure is needed that the seed is crushed and the oil exudes.

"The best remedy for this would be to charge the freight on the actual weight of the consignment, and not on the number of sacks."

[The above is a translation of the French article, and contains some points of information which may well apply to the operations of Queensland cotton growers.—Ed. "Q.A.J."]

YIELD OF COTTON IN INDIA.

A considerable reduction is estimated in the yield of cotton of India for the 1920-21 season. The Department of Statistics, India, in its third forecast places the outturn at 3,621,000 bales of 400 lb. each, as compared with the revised estimate of 5,645,000 bales at the corresponding period a year earlier, or a decrease of 36 per cent. As compared with the final forecast of 1919-20, the present estimate shows a decrease of 38 per cent. The area sown to cotton for the current season is 19,704,000 acres, as against 22,179,000 acres for 1919-20, or a decrease of 11 per cent. The reduced yield is due to the prolonged drought which characterised the season in cotton-growing districts in 1920. The December estimate of the 1920-21 crop of the United States of America was 16,234,000 bales of 400 lb. As regards Egypt, the Ministry of Agriculture, Cairo, states that the weather, on the whole, has been favourable for the cotton crop. The first picking is finished, and the second had been taken in in most places at the time the report was issued. The average yield of the crop is below normal.

Seed Wheat for Disposal.

AT HERMITAGE STATE FARM.

This Department has been experimenting for a number of years with several varieties of wheat as a result of crossbreeding and selection work at Roma State Farm; some have consistently given satisfactory results, very often under adverse conditions. These are now being offered to wheatgrowers, in order that they may have the opportunity of acquiring seed of varieties which have been tested and found suitable to soil and climatic conditions in the wheatgrowing districts of the State.

Orders for the undermentioned varieties (which are illustrated and described elsewhere) should be directed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Remittance must accompany order, and, in the case of cheques, should have exchange added.

The price quoted for any of the varieties offered is 11s. per bushel, f.o.b. Hermitage.

VARIETIES.—"Inglewood," "Patriot," "The Prince," "Gundi."
(*See* accompanying illustration of three of the varieties.)

In addition to the above a limited quantity of "Amby" is also available at the same price.

Inglewood.—Mid-season variety. This is derived from a cross between Bunge and Federation Wheat, and has given consistent results in the South-Western wheat areas. The plant is of medium height, and on strong soils is inclined to carry a fair amount of flag. It stools well and possesses a straw of medium strength. Heads are of medium length, slightly tapering; non-bearded. The chaff is smooth and light-brown in colour. Grain of medium size, somewhat elongated in appearance; semi-translucent.

Patriot.—Derived from a selection made after crossing Bunge and a Durum wheat. A mid-season variety, of moderate stooling habit. Straw is of medium height and somewhat tough. Flag scanty. Head tapering, non-bearded, open appearance, and of medium length. Chaff smooth and of a pale-golden colour. Grain somewhat short; full-blosomed; semi-translucent.

Plate 18.—Seed Wheat for Disposal.

The Prince.—A selected crossbred wheat; early mid-season variety, of fairly tall-growing habit, suitable for main-crop sowing. A good stooler, and carries very little flag. Head of medium length, open appearance, slightly tapering; non-bearded. Chaff smooth and of a pale-golden colour and somewhat closely attached to the grain, which is plump, full-bosomed, semi-translucent, and of medium hardness. Fairly resistant to rust.

Gundi.—A selection from a Bunge-Federation cross. A mid-season variety suitable for early sowing, of moderate stooling habit. It carries a medium amount of flag. Straw moderately stout and slightly under medium height. Head long and compact. Chaff smooth and light-brown in colour. Grain medium-sized; somewhat rough skinned; white in colour. This variety has given a yield of 37.2 bushels at Roma State Farm. More suited for Western and South-Western conditions than for the Downs.

Amby.—A popular variety suitable for main-crop sowing. It is a hardy mid-season variety and a good stooler, carrying a moderate amount of flag. Ears compact, non-bearded; chaff white and smooth. Grain plump and rather shotty in appearance; semi-translucent. Is an excellent milling wheat and has given good results in the principal wheat-growing districts.

AT STATE FARM, ROMA.

The following varieties of Seed Wheat are available for distribution from Roma State Farm. Price 11s. per bushel; free on trucks, Bungeworgorai:—

"Amby." **"Bunge No. 1."** **"Soutter's Early."**

Limited quantities of the following new wheats are also available at the same price:—

"Cedric." **"Inglewood."**

In the event of farmers desiring to have small quantities not exceeding 1 bushel of new varieties of Roma Crossbreds for trial this season, arrangements for their purchase may be made with the Manager at the same rate—*i.e.,* 11s. per bushel, free on trucks, Bungeworgorai.

Remittance, with exchange added, should accompany order, and be sent direct to the Manager, State Farm.

A NEGLECTED INDUSTRY.

Practically all members of the Capsicum family flourish in Queensland, and in many districts certain varieties are to be found growing wild, being looked upon in the light of mere weed growths. More particularly so is this the case in the smaller variety known as Bird's Eye (*C. minimum*), which is common to the scrub lands of the North, where its growth is phenomenally rapid.

A limited demand exists for this particular variety of the Capsicum family amongst bird seed merchants and cordial and condiment manufacturers; and it is thought that a profitable source of income could be derived from the systematic handling of a crop which flourishes in a wild state, and one which, if given cultivation on up-to-date lines, would well repay the amount of labour expended upon it.

At the present moment supplies of this class of Capsicum are being obtained from Zanzibar and Japan; and it is understood that the former product leaves much to be desired from the point of quality. Whilst we are content to import products of other lands and neglect those of our own which can be produced under the most favourable of conditions, so long will our progress be retarded; but, at the same time, it must be clearly understood that any product which is put on the market to oust that which is being imported must of necessity be equal to and, if possible, superior to it. This is the rock on which, unfortunately, too many are apt to go to pieces; and it is to the consistent producer of a good and reliable article that business will revert, and accounts for the fact that merchants prefer to buy oversea products which can be and are produced here of equal if not superior quality, but lack care and attention and, it might be added, common honesty in packing and placing on the market.

In connection with placing chillies on the market, the necessity of proper drying is emphasised; and with the moist climate of the North, sun-drying cannot be relied upon to produce a perfectly dry berry; consequently, some form of artificial evaporation would be necessary. The erection of a suitable evaporator need present no grave difficulties to the average man on the land who is at all conversant with the use of tools.

Emphasis must also be placed on the manner of harvesting the berries, which ripen somewhat unevenly and must of necessity be picked as they are ready. This necessitates going over the bushes at various intervals, as the inclusion of only partially ripe berries reflects on the bulk, resulting in unevenness of sample, the main source of complaint amongst buyers.

For those who are interested in the production of chillies, the following information may be of interest:—

A rich sandy loam is the most suitable for chillies, although satisfactory crops can be grown on a much heavier class of soil.

The plants are raised in seed beds, and, to produce plants which are hardy, robust, and even in growth, the seeds should be sown in drills spaced 8 in. or 9 in. apart. The bed must be kept watered, using a watering can with a fine ''rose,'' and the plants protected from frost. The land should be ploughed deeply and reduced to a fine tilth; and when all danger from frosts is over, and sufficient moisture is present in the soil, plant out the seedlings when 5 in. to 6 in. in height in rows 3 ft. 6 in. apart, allowing 2 ft. 9 in. between the plants in the rows. Choose a cloudy day and, if possible, showery weather for transplanting.

Frequent cultivation is necessary until the plants become too advanced in height to permit the passage of horse and cultivator between the rows. Keep down all weed growths, and encourage a soil mulch as much as possible.

Picking.—The whole of the plants should be gone over about once a week as soon as the peppers begin to ripen, and all ripe fruit taken off. Care should be taken to pick portion of the stem with the berry. After picking they should be allowed to lie in the sun for a day, in order to toughen the stem and prevent damage to the base of the fruit whilst drying.

Where it is possible, the fruit may be dried effectively on gently sloping iron roofs, but must be carefully removed in the event of weather becoming showery, and must at all times be covered from dampness arising from dew.

Dampness in any form, once the berry has become partly dried, is fatal to the ultimate curing; and for this reason, in the humid climate of the North, evaporators are advocated.

Yields vary with soils and climatic conditions; but when these are favourable 1,100 lb. to 1,300 lb. per acre may be regarded as an average crop.

Present quotations for imported chillies are in the region of 1s. per lb.

For those interested, the following list of bird seed merchants and cordial manufacturers of Victoria may be of service:—

CORDIAL MANUFACTURERS.

Barret Bros., 43-5 Holden street, Fitzroy.
G. M. Brooke and Sons, Whiteman street, South Melbourne.
J. Dickson and Co. Pty., Ltd., 16 Abinger street, Richmond.
P. G. Dixon and Co. Pty. Ltd., 193 High street, Prahran.
G. H. Elliott, 45 Rathdown street, Carlton.
Frankston Springs Co., 34 Drummond street, Carlton.
H. J. Gabble, 179 Clausen street, Fitzroy.
John Gow, Ballarat road, Footscray.
Mrs. E. Gray, Cromwell street, Caulfield.
Richard Gray and Sons, Davison street, Richmond.
R. Harrison, 8 Spring street, Fitzroy.
Harrison San Miguel, 405 Elizabeth street, Melbourne.
Hepburn Spa Pty. Ltd., 314 Collins street, Melbourne.
Mrs. M. A. Jacobson, Geelong road, Footscray.
Marchant and Co., 34 York street, Richmond.
Moonee Valley Cordial Co., Miller street, North Fitzroy.
Robert Moseley, 183 Boundary street, North Melbourne.
O'Neill Bros., 11 Woodside street, North Fitzroy.
O.T. Ltd., 193 High street, Prahran.
F. Rogers, 19 Malmsbury street. Hawthorn.
E. Rowlands Pty. Ltd., 266 King street, Melbourne.
Schweppes Ltd., 39 Lithgow street, Abbotsford.
Sharpe Bros., 31 Garden street, South Yarra.
H. Taylor, 430 Rae street, North Fitzroy.
Wilcox Bros., Dandenong.

BIRD SEED MERCHANTS.

White and Hancock, 296 City road, South Melbourne.
W. J. Purves, 268 Swanston street, Melbourne.
Jas. Railton, 273 Swanston street, Melbourne.
Walters and Sons, 251 Swanston street, Melbourne.
F. H. Brunning Pty. Ltd., 64 Elizabeth street, Melbourne.
Farmer and Co., 474 Collins street, Melbourne.
Moran and Cato, 277 Brunswick street, Fitzroy.
Radcliffe Bros., 42 Victoria street, Brunswick.
Crook's National Store Pty. Ltd.., 217 Commercial road, South Yarra.
C. W. Mitchell, 524 Elizabeth street, Melbourne.
J. D. Howie and Co., 194 Smith street, Collingwood.
Jas. Jones, 204 Chapel street, Prahran.
Law Somner and Co., 139 Swanston street, Melbourne.
Evans Rees, 58 Bourke street, Melbourne.
J. G. Cooke and Co., 182 Commercial road, Prahran.
W. E. Ruttledge, 405 Bourke street, Melbourne.

Messrs. Henry Berry and Co., of Melbourne, are also buyers of bird's-eye chillies for the manufacture of cayenne pepper. Inquiries have also been directed to this Office by Mr. V. A. Wawn, manufacturing chemist, 44 Elizabeth street, Sydney, who is anxious to obtain reliable supplies.

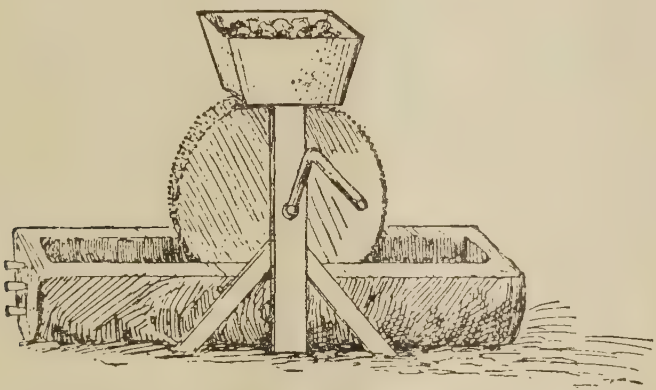
THE CULTIVATION AND MANUFACTURE OF ARROWROOT ON THE FARM.

In the dim past, arrowroot was grown on a small scale for home consumption, and it is surprising that while there are many farm products largely made use of for household purposes, and which do not require the aid of expensive machinery, arrowroot, the safest of semi-tropical crops and the least expensive to manipulate, should be neglected. There are two varieties of arrowroot which are grown in this State—viz., *Maranta arundinaceæ* and *Canna edulis*, known to growers as White and Purple Arrowroot. Both are bulbous plants, but the purple sort is a far heavier bean than the white. It is from the bulbs that the arrowroot of commerce is obtained. The bulbs of the purple variety vary in size from 6 in. to 12 in. in circumference.

The smaller bulbs are used for plants. Wide furrows, about 6 in. deep, are run out about 4 ft. apart, and the bulbs are dropped in from 2 ft. to 3 ft. apart and covered by the plough or hoe. Planting time is about the months of September and

October. The plants grow rapidly, and in about three months attain a height of 5 to 6 ft. Meanwhile the bulbs are growing in a cluster around the base of the stem, to which they are firmly attached. From six to eight months bring the crop to maturity. A touch of frost aids it by shrivelling up the tops and concentrating the starch in the bulbs. When the tops wilt without frost the crop is ripe. The mass of bulbs to be dug up is so heavy that strong forks are needed for the purpose.

The only preparation for extracting the starch is to first thoroughly wash the bulbs, after which they are grated into pulp under water. The grater is a primitive affair made of a side of a kerosene tin, or a stronger one is made out of galvanised iron into which holes have been punched, with the rough grating side outward. The operator then grates the bulb against this, allowing pulp and starch to go into the water. The bulb is then quickly reduced to a dark brown mass of fibry-looking pulp. The starch being heaviest sinks to the bottom. The pulp, being lighter than the starch, floats almost to the surface of the water, and is easily removed. A good plan is to cover the tub or tin with porous linen and to grate the bulbs over this. The pulp remains on the linen, whilst the starch passes through it. When a certain quantity of bulbs have been grated (always into the water), one or more tubs are made ready to receive the starch from the first. This is worked by hand until the starch, further cleansed, has passed through the linen. If then not sufficiently cleansed, it is worked through another receptacle until no more feculencies are seen. When the starch, which always keeps at the bottom, is perfectly clean it is spread out in the sun or in a dry room upon cloth, and thus freed of the last remnant of moisture. When perfectly dry, it may be put into bags or boxes, and will keep even for years in good condition. For production on a large scale as to-day practised by arrowroot growers, special ingenious machinery is employed, reducing the expense of the cost of production, while the quality is improved, as it is scarcely handled from the time of leaving the field.



The yield of bulbs of the purple variety varies from 10 to 15 tons per acre, and 1 ton of bulbs gives rather more than 1 cwt. of manufactured arrowroot. The white variety (Bermuda arrowroot) is grown and manufactured in the same way as the purple, but the yield is much less. All this is very simple. Enough arrowroot can be produced on a very small plot of land to supply a family for a year or more, and the manufacture can be carried out doing wet weather when rainy weather prohibits work on the farm. A simple machine was made by the writer some years ago, which accelerated the process of grating.

The primitive machine which we used for arrowroot production was home-made, and answered the purpose admirably. First, a log of about 2 ft. in diameter and 8 ft. long was hollowed out by axe and adze into the form of a trough. At the head of this trough was fixed a framework much like the wooden stand of a grindstone, only, of course, much taller. A large wheel was then cut from a perfectly sound gum log, 3 ft. in diameter and 1 ft. wide. Tin plates, turned into graters (requiring frequent renewal), by punching holes in them with a flat, wrought-iron shingle nail, were nailed on to the edge of the wheel, to which a stout wooden axle and windlass handle were attached. The wheel was fixed so as to revolve in the water with which the trough was filled.

On top of the framework was a wooden hopper, in which the washed bulbs were placed, falling on the grating wheel. One man turned this with ease, and the bulbs, thus rapidly grated, fell into the trough in the shape of pulp and starch. The former was removed by a scoop, and the latter subsided to the bottom. The water was then gradually drawn off by removing successive pegs inserted into the lower end of the trough. The starch was then dug out and washed in the usual way. Such a machine is quite good enough for making arrowroot for home use. A consignment of arrowroot thus produced we sent to London and sold it at 2s. per lb.

Such a machine would answer equally well for grinding cassava.

Pastoral.

SHEEP BLOW-FLY DEMONSTRATION.

A demonstration in connection with the blowfly pest will be given at Dalmally Station during the second week in April. Many Queensland pastoralists, and also some from New South Wales, are expected to attend. The object of the demonstration is to illustrate the methods adopted at Dalmally to combat the ravages of the sheep fly.

The Horse.

THE PERCHERON: A BRITISH HORSE.

The Percheron horse became only known when the omnibuses of Paris began to use a grey horse bred in the Perche, Picardy, Flanders, and Poitou; and this horse became one with a real good reputation around 1848. Those who wrote about him from that time were Charles de Sourdeval, Ephrim Houel, Charles du Hays, Napoleon de Saint Albin, Eugene Gayot, and Andre Sanson.

Charles de Sourdeval says that the Percheron breed has had all its good qualities from a bay stallion coming from the Cotes du Nord. This stallion was Young Rattler by Old Rattler and a Snap mare. He had been imported in 1820 to France by M. Wollaston, who had a stud farm at the Chateau de Crenan, ner Quintin, Cotes du Nord. This horse was born in 1811, and lived till 1836.

This Young Rattler had a great many sons, all dapple greys, who were standing in Normandy and Perche, among them Regrette, Antenor, Malplaquet, Meriadec, Pegase, Young Antenor, Eminence, Mortagne, Oxigene, Envie, Francois I., Heliotrope, Oscar, Birmingham, Gorlitz, Herbouville, Ulysse, Flibustier, Opicrinus.

According to Ephrim Houel, the importation of Sandy in the Perche made a noted improvement to the breed. This Sandy was a grey stallion coming from England, and he was the sire of two extra good stallions—Conquerant and Sandy.

Another English stallion, Pretender (1829-1842), had a grey son, Omar, who was standing in the Perche. And then another Pretender, born also in England, in 1859, and standing in France from 1865 to 1881, sired the greys Grison, Ardoise, and Coquelicot, who were also used in the Perche country.

The Norfolk Phenomenon, born in England in 1845, and used in France from 1851 to 1872, has a grey son, Obligeant, who also was used in the Perche district.

The Percheron horse owes, then, most of his qualities to the Hackney breed of England. This is absolutely sure, as the proofs are given here.

Charles du Hays did not say that the Percheron horse was descended from the Arabian horse. He wrote: ''He has that beautiful grey robe of the Oriental horse,'' but nothing else.

Eugene Gayot, who has been the most prolific writer on French horses during the nineteenth century, does not give an Arabian origin to the Percheron horse. His opinion is that the Perche country was the sole factor able to make a Percheron horse, even if the colts were imported from the Cotentin, the Vendee, and the Poitou:—''Britons, Boulonneses, Bourbourians, Flemish, Cauchois, Piccards, &c., are becoming Percherons under the climate and conditions of the Perche.''

If England wants now to make a cart horse that is able to trot, the foundation stock should be the English Hackney sire crossed on draught mares. By selection and feeding, the Hackney horse could be turned into a light draught horse. In Belgium around 1885-1890 the best light draught horses, named Ardennese, were made by using a Belgian horse on a Hackney mare. The Belgian horse himself is only an overgrown Hackney; he has the same points, the same action, but he weighs 700 lb. more. This is proof that the Hackney must have been used in the creation of the Belgian horse, and if he can make such a heavy horse he must be able to make a lighter one—*i.e.*, a cart horse that is able to trot.—''Farmer and Stockbreeder.''

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1921.

There was a remarkable decrease in the output during the month, due to the number of birds in moult. The laying of the groups was satisfactory, and, if anything, there is not so much moulting taking place in this section as amongst the single hen pens. Among the latter it is noticeable that the birds that have been troublesome through broodiness are the ones that are moulting, and also, at the same time, taking a longer period to come into lay again. There were two deaths during the month. Mrs. Anderson lost her E. bird from ovarian trouble, and E. A. Walters his through snakebite. The following are the individual records:—

Competitors.	Breed.	Feb.	Total.
	LIGHT BREEDS.		
*Geo. Trapp	White Leghorns	116	1,418
*O. W. J. Whitman	Do.	104	1,388
*Haden Poultry Farm	Do.	87	1,372
*J. M. Manson	Do.	117	1,363
*J. Newton	Do.	107	1,352
*Quinn's Post Poultry Farm	Do.	94	1,337
*L. G. Innes	Do.	114	1,332
Mrs. R. Hodge	Do.	119	1,323
*W. Becker	Do.	93	1,322
*J. J. Davies	Do.	84	1,319
Geo. Lawson	Do.	86	1,319
*Dr. E. C. Jennings	Do.	87	1,319
*N. A. Singer	Do.	78	1,314
*E. A. Smith	Do.	106	1,301
*T. Fanning	Do.	111	1,296
*W. and W. G. Hindes	Do.	112	1,268
*G. Williams	Do.	92	1,259
*J. H. Jones	Do.	88	1,259
*H. Fraser	Do.	95	1,253
*Thos. Taylor	Do.	109	1,243
*Mrs. L. Anderson	Do.	86	1,233
*B. Chester	Do.	79	1,219
*Mrs. L. Henderson	Do.	100	1,217
S. L. Grenier	Do.	100	1,215
*S. McPherson	Do.	84	1,195
Thos. Eyre	Do.	94	1,186
*Range Poultry Farm	Do.	75	1,158
E. Chester	Do.	96	1,147
Avondale Poultry Farm	Do.	113	1,139
H. P. Clarke	Do.	112	1,130
*S. W. Rooney	Do.	86	1,127
S. Chapman	Do.	110	1,118
R. C. J. Turner	Do.	92	1,097
C. Langbecker	Do.	83	1,095
H. A. Mason	Do.	112	1,092
W. Morrissey	Do.	88	1,091
C. M. Pickering	Do.	82	1,063
C. A. Goos	Do.	113	1,039
W. D. Evans	Do.	102	1,021
C. H. Towers	Do.	70	1,015
A. J. Andersson	Do.	77	977
Miss E. M. Ellis	Do. ... With	drawn	583

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
HEAVY BREEDS.			
*R. Burns	Black Orpingtons ...	90	1,354
*A. Shanks	Do.	98	1,352
*E. F. Dennis	Do.	84	1,325
*R. Holmes	Do.	65	1,283
*E. Morris	Do.	97	1,277
*A. Gaydon	Do.	60	1,247
*D. Fulton	Do.	78	1,237
*J. Cornwell	Do.	100	1,227
H. M. Chaille	Do.	94	1,207
*W. Smith	Do.	83	1,192
*A. E. Walters	Do.	64	1,164
Mrs. G. H. Kettle	Do.	112	1,161
*E. Oakes	Do.	62	1,156
Parisian Poultry Farm	Do.	95	1,148
*R. B. Sparrow	Do.	84	1,142
J. E. Smith	Do.	80	1,129
*T. Hindley	Do.	67	1,128
G. Muir	Do.	98	1,110
R. C. Cole	Do.	71	1,086
*J. E. Ferguson	Chinese Langshans ...	79	1,026
*E. Stephenson	Black Orpingtons ...	70	1,021
*Nobby Poultry Farm	Do.	49	976
G. Flugge	Do.	103	943
Total	...	5,836	77,405

* Indicates that the pen is being single tested.

RESULTS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	245	239	257	214	243	220	1,418
O. W. J. Whitman	224	219	255	233	206	251	1,388
Haden Poultry Farm	250	190	236	248	220	228	1,372
J. M. Manson	203	236	245	238	227	214	1,363
J. Newton	249	219	236	165	242	241	1,352
Quinn's Post Poultry Farm ..	248	232	233	195	202	227	1,337
L. G. Innes	174	212	233	250	249	214	1,332
W. Becker	234	225	235	219	193	216	1,322
J. J. Davies	238	226	227	190	232	206	1,319
Dr. Jennings	165	258	201	207	230	258	1,319
N. A. Singer	238	186	225	259	211	200	1,314
E. A. Smith	220	176	239	218	218	230	1,301
T. Fanning	118	233	220	238	249	238	1,296
W. and W. G. Hindes	197	221	186	231	218	215	1,268
J. H. Jones	213	208	218	228	212	180	1,259
G. Williams	191	217	222	213	233	183	1,259
H. Fraser	150	218	230	227	224	204	1,253
Thos. Taylor	237	209	178	227	201	191	1,243
Mrs. L. Anderson	245	227	220	190	162	189	1,233
B. Chester	218	187	225	187	212	190	1,219
Mrs. Henderson	182	205	215	192	222	201	1,217
S. McPherson	243	246	91D	138	252	225	1,195
Range Poultry Farm	143	182	215	255	177	206	1,158
S. W. Rooney	168	176	220	168	190	205	1,127

RESULTS OF SINGLE PEN TESTS—*continued.*

—	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
R. Burns	231	215	262	197	225	224	1,354
A. Shanks	191	243	215	270	187	246	1,352
E. F. Dennis	240	216	184	253	213	219	1,325
R. Holmes	202	206	211	222	238	204	1,283
E. Morris	222	217	219	177	226	216	1,277
A. Gaydon	195	263	206	174	170	239	1,247
D. Fulton	218	219	198	233	92	277	1,237
J. Cornwell	209	227	214	141	201	235	1,227
W. Smith	110	241	217	225	204	195	1,192
A. E. Walters	187	194	175	214	164	230	1,164
E. Oakes	174	242	178	102	220	239	1,156
R. B. Sparrow	209	137	210	183	176	227	1,142
T. Hindley	203	236	198	174	146	176	1,128
J. E. Ferguson	144	169	129	180	218	186	1,026
E. Stephenson	192	158	200	183	149	139	1,021
Nobby Poultry Farm	190	258	86	262	160	20	976

CUTHBERT POTTS,
Principal.

POULTRY CONFERENCE AT THE QUEENSLAND AGRICULTURAL COLLEGE, 19TH MARCH, 1921.

In compliance with the request expressed at the last Poultry Conference, held in September, 1920, the date of meeting was altered to March. Unfortunately, there were several conflicting appointments in the poultry world last Saturday; further, the weather was threatening; in consequence, there was not as large an attendance as might have been expected. However, as so often happens in these cases, the matter for discussion and the result arrived at are likely to be of exceptional value to all poultrymen.

On arrival the visitors were received by the Principal of the College, Mr. Cuthbert Potts, B.A., and the College Poultry Instructor, Mr. Harwood.

The morning was devoted to an examination of the competition birds and a general discussion on type, period for hatching, feeding, and general poultry management. It is impossible to give a report of this section of the conference; but it cannot be stressed too strongly that the mutual interchange of ideas and experience is of vast importance to those poultrymen who attend these conferences. This value of the meeting is certainly greatly amplified because of Mr. Harwood, a keen enthusiast, who has under his control each year the birds of some seventy different breeders. When Mr. Harwood talks on the various characteristics of these competing pens, it is an education.

After lunch, all present assembled in the lecture hall; and the Principal, as chairman, placed before the conference a suggestion for the inclusion of a cockerel test. In the course of his remarks Mr. Cuthbert Potts pointed out that the idea of this test was not altogether new. It had been strongly advocated at the last conference in September, 1920. As illustrating that others had arrived at the same conclusion—viz., that a cockerel test was essential if we were to obtain a permanent improvement in our poultry—Mr. Potts read a paragraph from the ''Feathered World,'' stating that the Harper-Adams Agricultural College was about to institute a male bird test. It was claimed that the Harper-Adams College was the first to move in this direction; but he thought that this claim might not be entirely correct, as the date of the ''Feathered World'' was 10th December, 1920; whereas a possible cockerel test had been outlined at our September conference.

The scheme was then briefly outlined, and was subjected to keen criticism. Finally, it was unanimously agreed that the competitors present would support the scheme; and the details of the contest were left for the College to draft out.

In effect, the test will be somewhat as follows:—

Several leading competitors in the current competition, whose birds conform to type, weight of egg, &c., will be offered the opportunity to have a cockerel tested.

The breeding of any such cockerel must be known and stated.

The bird will be mated with three of the competitors' best pullets, as determined in the current test, and also with three approved indiferent layers.

During the mating season each pullet will be trap-nested until a sufficient number of eggs has been obtained to ensure that, on incubation, at least six pullets will result from each individual mating.

These pullets will be trap-nested for the full next year, commencing from 1st April.

Should all the female progeny of any cockerel prove to be high producers, such cockerel will receive a certificate by seal ring, and all his male progeny out of the proved high producing mothers will also be retained. One or more of them may be carried on for further test or they may be sold for the owner under the College supervision.

By the above test it is hoped to demonstrate whether high fecundity is transmitted by the male bird, and, if so, to establish a strain whose male birds will have a hearted support.

It is to be hoped that all poultrymen will give this proposed test their whole-hearted support.

PUBLIC CURATOR OFFICE.

A BUSINESS PROPOSITION FOR THE FUTURE.

All over Queensland there are families whose happiness is the result of foresight of men who while still living have made wise provision for the future. There are over 12,000 of these men who have made wise provision for the future of their families by making Wills, appointing the Public Curator their Executor and Trustee.

One of these men, who is typical of many others, looked into the face of his loved ones and thought:—"They are happy now; but how can I ensure their happiness in the years to come?"

He made a Will. For his wife, inexperienced in business matters, he placed a trust fund to protect her against the tragedy of ill-advised investments. For his children's education, he set aside a special fund. For his boys, he provided that their whole share of the estate should be paid to them at a matured age. For his daughters, he provided that their shares should be kept in trust during their lives, so that, married or single, they would be financially independent.

Then came the question: Who was to carry out these trusts? He decided that it would be unfair to his wife to ask her to manage property, which it had taken his utmost labour and efforts to accumulate; nor did he think it a fair thing to appoint any of his friends, no matter how trustworthy they might be, Executors under his Will, for they might die at any time, and throw the administration of his estate into hopeless confusion.

This prudent man appointed the Public Curator of Queensland Executor and Trustee, because he had attributes and powers which no private person had, such as State guarantee, continuous existence, accumulated experience, financial responsibility, perfected machinery of administration, and an experienced legal staff to carry out all the legal work of administration without extra cost to the estate.

Therefore, to-day, long after this man's death, the Public Curator is serving his family from year to year, his officers acting with understanding of each individual's needs, while observing a strict impartiality.

As this man made provision, so any man can provide, in proportion to his desires and means, for his family's future.

A pamphlet giving full information concerning the Public Curator Office may be had on application, either to the Public Curator in Brisbane, to his Local Deputies at Rockhampton and Townsville, or to any Clerk of Petty Sessions in the State.

Elizabeth street, Brisbane,
25th February, 1921.

Dairying.

WHAT THE BULL MEANS TO THE HERD.

"South Downer" contributes the following advice to dairy farmers in England (in the "Live Stock Journal"), which should also be considered by Queensland owners of dairy herds:—

With the lesson "Pedigree Pays" so constantly before his eyes in 1920, we must hope that the ordinary tenant-farmer—the man who, although anxious that his cows should yield well, yet rather turns up his nose at pedigree—will learn the obvious lesson and endeavour to build up a herd of pure-bred cattle.

To the man with a real love for well-bred stock the type of bull used in the past in such herds has been somewhat appalling, the axiom "anything will do so long as he gets a calf" having been carried to the extreme limit; but, luckily for the good of the breeds in this country, this pernicious notion is fast dying out, and there seems to be a real desire on the part of the small man to grade up his stock to a higher level.

The influence of a good bull on a herd can hardly be over-estimated, for he has it in his power to make or mar its future progress in the world.

Authorities on breeding are in agreement that a breeder will never advance his herd on the upward path unless he employs bulls of better class than his own females, and this, therefore, should be the aim of the farmer.

Where milk is desired only pedigree bulls of proved milk-yielding strain should be used, and preferably a bull whose heavy milk-yielding ancestors go back as far as the third dam on each side. "Breed both ways for milk," say some of the older farmers, and experience has proved them right.

That great judge of Dairy Shorthorns, Mr. R. W. Hobbs (now, unhappily, deceased), in speaking of the selection of a bull, said: "My advice is in every case to secure the best, and before making a purchase see his dam if possible. One should not be satisfied with the milk record only, but should also be assured that the bull comes from a good cow with a shapely udder. . . . . The purchaser must be most particular that the sire of his bull likewise comes from a good milking family, and it will be much in the bull's favour if heifers by his sire can be seen showing good udders and milking well." Advice from such a source is worth its weight in gold to the ordinary man.

The unrestricted slaughter of calves has seriously depleted our stock of milch cattle, and now it behoves our farmers when building up the stock to breed only the best. The whole world is in keen competition for our pedigree stock. Never has there been such a world-wide demand, and it is up to us to satisfy it, and maintain our proud position as the "stud farm of the world."

It is being done, and can continue to be accomplished, certainly without the aid of imported stock, which would prove to be but the "thin end of the wedge." That is an innovation British farmers must sturdily set their faces against.

But in speaking of the bull as "half the herd" we must bear in mind that it is well-nigh useless to expect improvement in the herd unless it is found out which cows are of no use in the herd, and this can easily be done by means of carefully kept milk records.

By the careful weighing of each cow's milk morning and evening, in a little while it can be discovered which cows should be disposed of as quickly as possible. It is waste of time to feed the unprofitable cow; moreover, there is no place for her in this workaday world of utility cattle. She should be fatted out and sold.

Once more, may we say that while so much depends upon the wise choice of a bull, yet we must not forget that we owe it to the sire to give him a decent foundation stock on which to build. It is only by such means that we can hope to form a really successful herd.

HOW DAIRYING PAYS.

A correspondent at Dorrigo (New South Wales), who owns a herd of twenty-one cows, states that his butter returns from these cows averaged 9 lb. per cow per week. At 2s. 2½d. per lb., he received £85 from the factory in the month of December, 1920. Thus each cow was worth £4 odd. With reference to this, Mr. Graham, Chief Dairy Expert, Department of Agriculture, Queensland, states that several herds within this State have yielded an average of butter-fat quite equal to and, in some cases, slightly higher than that mentioned by the Dorrigo dairy farmer.

PIG FEEDING WITH JUDGMENT.

A light and sparing diet should be given after farrowing, as many sows are feverish. Gruel, oatmeal porridge, whey, and such like should be the diet until the sow regains some of her strength. In a case of being debilitated and requiring strength, strong soup, bread steeped in wine or in a mixture of brandy and sweet spirits of nitre, administered in small quantities, will often prove beneficial. Gradually the rations must be increased and given more frequently. They may consist of all kinds of roots, carrots, turnips, potatoes, and beetroot, well steamed or boiled, and never given raw. Bran, barley, oatmeal and bean flour, Indian corn, whey, sour milk and butter milk are all perfectly adapted for this period.

Should the animal appear to require it grain, well bruised and macerated, may also be added. Bean flour is considered by many to create an abundance of milk, and there are some who think barley meal is too stimulating, and they advise that it should never be used alone, but always one-third oatmeal to two-thirds of the barley meal. Whenever it is possible the sow should be turned out for an hour each day to graze in a meadow or clover field, as the fresh air and exercise and herbage will do her an infinity of good. The young pigs should be weaned when they are from eight to ten weeks old. Some are weaned as early as six weeks. The weaning should be done gradually, being allowed to suck six times a day, then four times, and at last only once.

There is little doubt that many cases of sickness occur among pigs through their being fed upon food which, in regard both to quantity and quality, would be better suited to the late autumn or winter season than to the present time. At those seasons demands are made upon the system which call for a good supply of rich food to keep up the bodily heat of the animals and enable them to withstand the effects of cold and inclement weather. In summer the conditions are changed, the animal heat being kept up with little effort, and thus it is that a lighter diet should be fed to the pigs during hot weather. Instead of giving them their food in a thick porridge-like mass, as is the case in winter time, thin it down well with some good sweet whey, kitchen slops, or waste milk. The animals will drink this with a relish, and it will be better for them in every way than thick, heavy food.

It makes all the difference in the profits whether the sow produces good strong pigs and then feeds them well, or produces a litter of weaklings and then has nothing for them to eat; whether her system is nice and cool, or feverish and hot. In the one case she will be good-natured and let the pigs suck, and will furnish plenty of milk; in the other, fretful and peevish, and the chances are that she will eat her pigs as soon as born. These conditions depend very largely, if not entirely, upon the way the sow is treated and fed during pregnancy. It is an almost unheard of occurrence for a brood sow running out on good pastures ever to eat a pig. Sows are not cannibals by nature, and are only made so by the ignorance or foolishness of the owner. The best food for a sow is coarse wheat middlings or reground bran, or bran and middlings may be mixed half-and-half, which should be made into a stiff mass with skim milk if possible; if not, with the house slops or water.—"Live Stock Journal."

DRYING TOMATOES.

There are many ways of drying that perfect esculent, and thus preserve it under a condensed form, easy to keep, easy to carry, and most handy to use.

The best known is the following, given us some time ago by Mr. H. A. Tardent when manager of Westbrook State Farm:—Take good, fleshy tomatoes and place them in a tinned copper boiler. Boil over a moderate fire until the skins separate from the flesh; then pass through a sieve to strain off the skins and seeds. Then boil again to evaporate as much moisture as possible without burning. Then pour out on to plates, saucers, or shallow dishes (for commercial purposes, square, specially-made moulds are better, as the dried tablets thus pack well in cases). The pulp should not be thicker than in half-inch layers. Then expose to sun and wind, taking care to cover the moulds with sheets of butter-cloth, as flies are apt to deposit eggs in the pulp.

Stir, also, occasionally, the crust which forms on the surface, as otherwise the moisture cannot escape, and this would engender mouldiness under the crust. The process is greatly hastened by finishing the drying in a cool oven, or, if available, in an evaporator. When the tablets are thoroughly dry, let them cool, and pack in airtight boxes.

The Orchard.

INTERSTATE CONFERENCE OF FRUITGROWERS AND GOVERNMENT FRUIT EXPERTS.

An Interstate Conference of fruitgrowers and Government fruit experts, convened by the Commonwealth Government, was recently held in Melbourne. There were present:—Messrs. W. J. Hannaford (representing South Australian growers); G. Quinn (South Australian Government); R. W. Peacock (New South Wales growers); Allen (New South Wales Government); Wayman (Queensland growers); Lang (Victorian growers); Carmody (Victorian Government); Scott (Tasmanian growers); Ward (Tasmanian Government); Boardman (Australian Fruitgrowers' Conference), Meeking (Commonwealth Government); Wickens (Western Australian Government); and Ramage (representing Western Australian growers).

After consideration the following resolutions were carried and forwarded to the Minister for Trade and Customs:—(1) That this conference affirms the desirability of adopting standardised methods of grading and packing apples and pears for export for overseas markets. (2) That the standards for packing and grading apples, and also for sizes and measurements of apple and pear packages, be in accordance with the following:—

Apples.

(1) They shall be packed in three grades; (2) they shall be packed in packages of prescribed sizes; (3) the packages shall be legibly and durably branded with the following:—(*a*) The initials of the christian name and full surname and address of the grower or exporter or his registered brand, or, in the case of a firm or corporation, with the firm or corporate name and address or registered brand, on one end of the package in letters of not less than one-half an inch in length; (*b*) the designation of the grade ("Extra Fancy," "Fancy" or "Choice," as the case may be) in letters of not less than one-quarter of an inch in length on printed paper labels, and not less than three-quarters of an inch if stencilled on cases. (4) Apples for export must be graded into one of three grades—viz., "Extra Fancy," "Fancy," and "Choice"—specific details of which are set out hereunder. The fruit in all grades shall be so packed that the outer layers or shown surfaces shall be a true indication of the average grade of the fruit throughout the package. Apples of only one size and one variety shall be packed in any one case of any grade. (5) "Extra Fancy" apples shall consist of sound, clean, well-formed apples. They must be free from all insect, fungus, visible bitter pit, and other blemishes. Full coloured varieties of this brand shall have each apple coloured to the extent of not less than one-half (50 per cent.) of its skin with good red colouring. Striped varieties must not have less than one-third (33⅓ per cent.) of their surfaces coloured with distinct red stripes or streaks. Yellow and green varieties shall be even in colour, but may show flushes of another colour where such are natural to their respective kinds. "Fancy" apples shall consist of sound, well-formed apples, free from visible bitter pit and serious blemishes (excepting blemishes caused by rubbing, black spot, or caterpillars). A maximum of 10 per cent. of the whole of such apples in a case shall be allowed black spot markings not exceeding in extent upon each such apple the area contained in a circle of which the diameter is one-quarter of an inch. Full coloured varieties of this kind shall have each apple coloured up to the extent of at least one-third (33⅓ per cent.) of its skin with good red colour. Striped varieties shall be distinctly striped or streaked over not less than one-tenth (10 per cent.) of their skin surfaces. Yellow or green varieties shall be even in colour, but may show flushes of another colour where such are natural to their respective kinds. Not more than one-tenth (10 per cent.) of the fruit in a case may carry blemishes. "Choice" apples shall consist of apples true to name, skin unbroken, reasonably free from visible bitter pit. Slightly blemished apples may be packed, but such blemishes shall not exceed 20 per cent. in a case. A maximum of 10 per cent. of the whole of such apples in a case may be allowed black spot markings not exceeding in extent upon each apple the area contained in a circle of which the diameter is three-eighths of an inch. Russeting of the apple not to be considered a blemish. (6) The apples in each grade shall be in size as follows:—"Extra Fancy," not less than 2½ in. in diameter, excepting that normally small varieties may consist of specimens of not less than 2¼ in. in diameter. "Fancy," not less than 2¼ in. in diameter. "Choice," not less than 2 in. in diameter. The size of the fruit contained shall be marked on the package in figures of not less than one-quarter of an inch on

printed labels, and not less than three-quarters of an inch if stencilled on the case. A variation in size to the extent of one-quarter of an inch, that is one-eighth of an inch above or below the marked size, may be allowed, except in the case of minimum sizes.

PEARS.

(7) Pears must be graded in similar grades to apples, and each package shall only contain pears of a uniform size, without restriction as to size of any variety in the "Choice" grade. Provided that a variation of not more than one-quarter of an inch—that is, one-eighth of an inch above or below the marked size, may be allowed. Colour requirements need not be considered as are required for apples. Other requirements as to blemishes and black spot shall apply equally to pears and apples in the respective grades.

SIZE OF PACKAGES.

(8) In all bushel cases a variation of 6 per cent—that is, 3 per cent. under or 3 per cent. above—of the total cubic capacity of the case may be allowed.

(9) Apples and pears for export shall be packed in one of the following packages:—

Australian bushel—18 in. long by 14¼ in. deep by 8⅔ in. wide.

Canadian bushel—20 in. long by 10 in. deep by 11½ in. wide.

Flat bushel—26 in. long by 14¼ in. deep by 6 in. wide—clear of divisions.

Three-quarter flat bushel—24 in. long by 11¾ in. deep by 6 in. wide—clear of divisions.

Australian half bushel—18 in. long by 8⅔ in. deep by 7⅛ in. wide.

Half flat bushel—26 in. long by 7⅛ in. deep by 6 in. wide—clear of divisions.

Pear tray—18 in. long by 3¼ in. deep by 14¼ in. wide.

Pear tray—18 in. long by 2⅞ in. deep by 14¼ in. wide.

The measurements given are to be the inside dimensions of the cases.

FERTILISERS FOR FRUIT.

When it is considered that the yearly production of fruit in an orchard is a continuous system of cropping, and is even more exhaustive than ordinary mixed farming, the need for fertilisers can be easily understood. Artificial manures are necessary to restore fertility, and it must also be borne in mind that the stimulus given to growth by judicious manuring enables fruit plants to withstand disease and adverse conditions.

With the extension of fruitgrowing within recent years, more attention has now to be given to the production of a larger proportion of first-grade fruit. On soils which are naturally suited for fruit cultures, normal crops of average quality may be grown without fertilisers, but consistent yields of fruit of superior quality can only be got by liberal manuring.

To get the best results the application of fertilisers must be co-ordinated with thorough cultivation. Land intended for fruit growing ought to be deeply cultivated previous to planting; and to ensure good drainage it is advisable to have the subsoil broken up. The trees and bushes should not be crowded closely together. If well set apart there will be a better distribution of air and light around each plant when the orchard reaches maturity. During the growing season the surface under the trees and bushes should be frequently stirred to prevent evaporation, and the intervening space ought to be dug or cultivated at least twice a year.

The fruitgrower must find out for himself the fertilisers which give the best returns under his own particular set of conditions. The essential constituents—nitrogen, potash, phosphoric acid, and lime—have to be applied in amounts suitable for the special requirements of the different fruit crops, and in accordance with the variations of soil and climate. Without an adequate supply of each of these elements of fertility, the best results cannot be expected.

NITROGEN.

Nitrogen promotes a healthy growth of foliage, and this in turn gives rise to a stronger and more extended root system. It induces an early and vigorous development of the buds and young wood. Nitrogenous fertilisers should be used in conjunction with potash and phosphates to ensure a full crop. Stable manure and nitrogenous fertilisers supplying organic matter are very beneficial for young orchards on light soils.

POTASH.

Potash is pre-eminently the fertiliser which produces quality. It forms a large part of the ash of fruit trees, and is really the dominant plant food for the production of fruit crops. It plays an important part in the ripening of the wood and in the setting of the buds and blossoms, and is most essential for the formation of sugar in the fruit. Where potash manures are regularly applied to fruit crops, they grow a stronger and healthier foliage and give a heavier yield of large-sized fruit of exceptionally fine taste, colour, and aroma. It is frequently observed that wine from vineyards manured with potash is of a superior quality.

The different grades of potash salts produced by the Alsatian mines, now under French control, can be relied upon to give good results on all fruit crops. Muriate of potash and French manure salts, 20 per cent. and 30 per cent., are the grades of potash principally used by the viticulturists in France. Applied in this form in the autumn or winter, along with phosphates and organic manures, potash gives a very profitable return.

PHOSPHORIC ACID.

Phosphates exert a considerable influence on the formation of the seed, and subsequently on the ripening of the fruit. They prevent exuberant growth of wood and foliage, and promote development of the buds and flowers.

LIME.

Lime counteracts acidity in the soil and helps to break down organic manures. As a base it sets free plant food and furthers the action of the fertilisers. It improves the texture of the soil and thereby gives better drainage. Lime is required in considerable quantities by all fruit plants, and more especially by stone fruits. Good results will be got by applying a heavy dressing of lime (12 cwt. to 15 cwt. per acre) every few years.

The productiveness of an orchard depends on so many factors that no hard-and-fast rules can be laid down with regard to manuring and other treatment. Under average conditions, however, the following quantities of fertilisers have given consistently good returns:—

Potash.—1½ cwt. muriate of potash or 3-4 cwt. French manure salts, 20 per cent., per acre.

Phosphates.—2 cwt. superphosphate or 3-4 cwt. basic slag per acre.

Nitrogen.—1-2 cwt. sulphate of ammonia per acre.

FERTILISERS FOR APPLES AND PEARS.

Both apples and pears may be grown successfully on any average soil if it is well drained, but generally the better the soil the heavier the yields. They readily exhaust the available plant food in the soil, and consequently often deteriorate into bearing a crop only every other year. To obtain successive crops of apples and pears it is necessary to apply complete well-balanced manures. Green manuring, or an application of well-rotted dung, 10 to 15 tons per acre, along with a dressing of phosphates and potash in the autumn after pruning, will prove very beneficial.

The following proportions of artificial manures are recommended:—

Per acre (distributed broadcast).—2 cwt. of superphosphates, 4 cwt. French manure salts, 20 per cent.

Per tree, for young orchards (distributed round the trees).—1½ lb. of bone meal, 1 lb. muriate of potash, 1 lb. sulphate of ammonia.

STONE FRUITS (PLUMS, PEACHES, CHERRIES, DAMSONS, APRICOTS, ETC.)

These fruits do best on rich, deep loam, overlying calcareous sandstone. They require a soil which is neither too wet nor too dry. Stone fruits are readily damaged by dry conditions. To prevent this, the surface soil should be kept loose by constant hoeing. As a good deal of lime is required for the formation of the stone, regular dressings of lime should be given if the soil is not naturally calcareous.

The following manures give good results on stone fruits:—

Per acre.—3 cwt. of bone meal, 3-4 cwt. French manure salts, 30 per cent.

Per tree, for young orchards (distributed round the trees).—2 lb. bone meal, 1 lb. muriate of potash.

Stable manure at the rate of 15 tons to the acre should be given in the autumn in addition to the above fertilisers.

BUSH FRUITS (CURRANTS, GOOSEBERRIES, RASPBERRIES, ETC.).

These bush fruits flourish best on good fertile land. They are gross feeders and require an abundance of nitrogenous manure. The application of farmyard manure at the rate of 20 tons to the acre, and liquid manure at the rate of 3 gallons to the square yard, will give excellent results. A liberal dressing of potash and phosphates at the following rates is also necessary:—

Per acre (applied in the autumn on early winter).—4 cwt. of French kainit, 14 per cent., or 3 cwt. French manure salts, 20 per cent., 4 cwt. superphosphate, 30 per cent., or 5 cwt. basic slag.

STRAWBERRIES.

The best soils for strawberries is a rich, sandy loam, provided it does not dry up too readily. In spring they should receive a dressing of lime between the rows to check insect pests, and afterwards a heavy mulch of cow dung. The fertilisers advised for bush fruits give good results on strawberries.

CITRUS FRUITS (ORANGES, LEMONS, GRAPEFRUIT, ETC.).

The ideal soil for citrus fruits is a light retentive loam with good natural drainage. A very sandy soil is unsuitable because it does not retain moisture very well, and fertilisers become washed out of it too readily. As citrus trees are deep-rooted, it is necessary that the soil should be free and open so that the roots can penetrate downwards.

In order to prevent the too rapid evaporation of moisture, every effort should be made to keep the surface soil round the trees in a loose, pulverised condition. It is also advisable to plough in cover crops to maintain the humus content of the soil, as the wastage of organic matter is very rapid in the warm districts where citrus fruits are grown.

Of the fertilisers required for citrus fruits, potash is by far the most important. It is of the highest value for the proper growth and health of the trees and for the formation and ripening of the fruit. Light soils are generally deficient in potash, and heavy soils do not as a rule contain it in a very suitable form.

Young trees on light soils should receive a complete manure containing the following percentages:—

3 per cent. nitrogen, 5 per cent. phosphoric acid, 5 per cent. potash. At the rate of 1 to 3 lb. per tree.

For trees over six years.—1½ cwt. sulphate of ammonia, 1½ cwt. superphosphate, 2 cwt. muriate of potash, per acre.

VINES.

The grape vine requires a good deal of moisture under ground, but it does not do well on cold, water-logged soils. The best vineyards are on well-drained slopes where the soil is rich in lime. A deep, free loamy soil is most desirable for grape vines.

Vines respond well to good treatment, but require complete, well-balanced manures. The excessive use of nitrogenous manures without a sufficiency of phosphates and potash will readily produce insipid fruit, which will not keep well. Grapes are rich in sugar, and as potash is essentially the element required for the production of sugar, it is of prime importance as a fertiliser for vines.

Farmyard manure has a very beneficial effect on vines, and it can be applied at the rate of 10 tons per acre along with the following fertilisers:—

½ cwt. sulphate of ammonia, 3 cwt. basic slag, 4 cwt. French potash salts 30 per cent., per acre.

Insufficient manuring is a common cause of unfruitfulness in orchards and plantations. To make fruitgrowing a paying concern, it is most essential to have regular and early crops of good marketable fruit. These requirements can only be met by applying liberal dressings of organic manure supplemented by artificials.

NOTES ON LEMON-CURING.

We have lately received inquiries from various sources with reference to the preservation of lemons for market, and we cannot do better than republish some notes on this subject by Mr. Daniel Jones, who obtained the information from the late Mr. W. S. Williams, of Doncaster, Victoria. Mr. Williams was the most successful grower of lemons in that State, handling about 6,000 cases annually. He explained

that to carry out the process of lemon-curing as here outlined, does not require the expenditure of much capital; an intelligent orchardist by use of a little native ingenuity can very easily devise for himself a cheap if rude construction as well adapted for the storage of citrus fruit equally as well as may be possible in the more pretentious and costly constructions. The chief thing to keep in view is that thorough ventilation, by means of as constant a current of cool air as it is possible to obtain, is the prime desideratum. Probably more depends on this item in the process than on any other, while it is very necessary that in cutting your fruit from the trees all possible precautions must be observed to handle without bruising: be the care ever so great in the field, in the event of imperfect ventilation taking place in the storage cellar the presence of the carbonic acid gas which generates, as is usual when fresh fruit is stored, will inevitably destroy the product, by reason of defective arrangement for the ventilation of the cellar. An extract from the ''Melbourne Leader'' will convey more tersely than I can describe them the points I wish to emphasise and which I fully endorse.

A good deal of attention is being paid this year to experience in lemon-preserving. All sorts of theories about dipping in all sorts of solutions are being promulgated, and some of them may contain the germ of successful methods. It ought to be borne in mind, however, that the most successful lemons, as regards quality and distant trade, are those of Sicily, and these are not dipped or ''preserved'' at all. The method consists of cutting the fruit while yet green and allowing it to ripen in darkness, with an equal temperature and perfect ventilation. The Sicilian lemons carry round the world, and preserve their delicate appearance without any dipping or other external application of chemicals. That ours will do the same has been abundantly proved even in Parramatta, where, writes a Sydney exchange, the greatest lemon-preserving failure of last year took place. But in that case the untoward result was occasioned by neglect of the simplest principles of ventilation. The lower portion of the storeroom was airtight, and there were gratings, &c., overhead. The gas generated by the fruit, being much heavier than atmosphere air, persisted obstinately in lying on the floor, and gradually rising as it increased in quantity, so that presently the lemons were soaking in a bath of carbonic acid gas. The same course ruined many shipments of citrus fruit on the way to England. But lemons laid on the floor of cellars with due provision for a current of air from below have kept for many months, and preserved all the freshness of appearance, while acquiring that peculiar shade of colour which connoisseurs insist on. Probably some processes will claim to be successful simply because the other surroundings have been suitable. In any case, the grower who provides himself with a storeroom which can be kept dark and well ventilated, while the temperature is consistently low, may feel quite sure that he can keep his lemons all right, and be ready for a good market when it offers.

THE CELLAR.

The building used for curing the fruit is a combination of a cool cellar and packing-house. It is built on an elevation where good drainage is possible, as this is a factor that must not be overlooked in constructing a curing-house. Damp floors, damp walls, and such conditions will adversely affect the curing processes.

The cellar in this instance is excavated to a depth of 9 ft., and is 18 ft. wide and 35 ft. in length. The walls of the whole structure are 20 ft. in height, which permits of the occupation of the above-ground portion for ordinary purposes. The walls are built of brick and are double, with a 2-in. space between, which provides the needful ventilation, gratings being let into the wall near the floor at every few feet, through which a constant current of air is passing. The floor is of single brick, with effective provision for drainage beneath—a matter of importance. The roof is of galvanised iron. There is nothing in the structure but what any ordinary tradesman or handy man can easily and cheaply construct; an ingenious man may vary the method of construction to suit his local circumstances either in material used or expenditure. The principal object in view is the construction of a cellar by which the temperature can be lowered to about 53 to 57 degrees Fahr., the range of heat Mr. Williams finds favourable in Victoria for successful curing of both lemons and oranges.

The method adopted in gathering the fruit is to clip the lemon carefully as near to the fruit as possible, pack into ordinary cases, which are conveyed to the packing-house and remain for a couple of days in the cases before being transferred to trays in the cellar. The lemons are cut when just turning yellow, and when cured the short piece of stalk left on will drop off the fruit if just touched by the finger, which is one way in which Mr. Williams determines the curing stage. The usual time taken to cure is from seven to eight weeks, sometimes longer, and is dependent somewhat upon the character of the season and the crop. Lemons thus cured will keep for twelve months, a sufficient time to meet all commercial demands. The lemons after a couple of days are removed and laid, without any packing, in shallow trays that

hold but one layer of fruit. The form of tray most favoured is one constructed from the Maryborough orange case cut in half; this, in Mr. Williams' opinion, is the ideal curing-tray. These are now packed one on top of the other in the cellar, and, save for an occasional overhaul to remove any faulty fruit, are left in this state until required for market.

TINNED PINES.

The recent cabled criticisms of carelessly canned Australian pineapples have had a stimulating effect in the direction of improving the trade. In a letter published early this week, one English buyer of Queensland pines acknowledged that the last consignment he received was vastly superior to those which he handled a year or so ago. The Queensland State cannery also has made some wonderful improvements in its plant and processes. The result of these reforms was lately demonstrated, when the Trade Commissioner, in the presence of a few enthusiasts, opened for comparison various tins of pineapples. Some of these samples were from the State cannery and others were from Hawaii. It was found that the Queensland article was quite equal to the famous Hawaiian, not only with regard to flavour, but also in its general get-up. That this high standard of locally tinned pines is a recent accomplishment is shown by comparing a tin taken from this season's lot with a tin taken from an old pack. The improvement is largely due to the fact that the obsolete machines which produced the old unsatisfactory results have been scrapped, and the new Ginaca machines, similar to those used in Hawaii, installed in their place. New, smartly labelled tins also add to the appearance of the goods turned out. Tinned fruit of indifferent quality, badly graded and carelessly packed, has had in the past a bad effect on the English market, and Queensland pines, in common with other lines, have suffered in the United Kingdom. But these defects are being speedily eliminated, and, according to Mr. W. H. Austin, there is now "nothing on the English market to beat the present product of the State cannery."—"Daily Mail."

PACKING FRUIT FOR EXPORT.

It was lately reported from Murwillumbah (N.S.W.) that a consignment of bananas from Queensland arrived by sea in a "boiled" condition. As some that were sent by train were similarly affected, the blame could not attach to the shippers. About 120 cases sent from Woombye and 63 from Currumbin arrived in this condition. The consignment from Woombye was all dumped at the growers' expense, and 28 cases of the Currumbin consignment realised a total of £7, and the balance 12s. per case, when the market rate for good fruit was 21s. per case.

It is evident (the report adds) that in some instances neither train nor boat is responsible for the damage, but a lack of care by the growers. Recently a consignment of bananas was dumped at Murwillumbah Station three days before the departure of the boat from Byron Bay, and these were "boiled" before they were placed in the truck. Care is necessary to ensure that the fruit is carefully picked in a proper condition and is given every protection during transit.

A SPLENDID MANGO.

Mr. Edwin Allen, of Merton street, South Brisbane, brought to this Office, on 7th March, a very fine mango weighing 2 lb. 5 oz. Another one from the same tree weighed 2 lb. 9 oz. The lighter one was 9 in. long, and measured 11½ in. in circumference. Unfortunately, nearly all the fruit was destroyed by the hailstorm. The stone was 6½ in. in length. The tree is supposed by Mr. Allen to be a sport, but this will be decided later on, as some of the seed (or stone) has been planted. There is very little fibre in the fruit, but the full flavour of the ripe mango is not pronounced.

LEMON GROWING.

Mr. W. H. Lambert, Paddington, is a successful lemon-grower. Last June his trees bore a crop of rough lemons in clusters of six, as depicted in the issue of this Journal for June, 1920. This year the trees have borne exceptionally well, many of the branches carrying a cluster of eleven marketable fruits. It was intended to give an illustration of them, but they, unfortunately, all fell off before they could be photographed. With the exception of numbers, the fruit was of the same quality as those of last year.

Horticulture.

SEEDS WHICH SHOULD NOT BE SOWN FRESH.

There are flower and vegetable seeds which quickly lose their germinative power, and must be sown fresh. On the other hand, seeds of the Cucurbitaceæ—such as melons, cucumbers, &c.—are recommended to be sown when several years old. For early sowings of turnips it is necessary to sow old seeds. The influence of time on the germinating value of seeds is a well-established fact; and it is hardly possible to account for this influence otherwise than by the theories put forward by Jules Rudolph in a paper published in the ''Revue Horticole'' in 1903, in which he stated that in a book, published anonymously in 1765, he found the following passage about stocks:—

''Many amateurs and professional gardeners are certain that stock (Giroflée) seed kept for five (5) or more years give a larger percentage of doubles than fresher seed. Taking for granted that this is really a fact, the reason is that the seeds which can only produce single stocks decay, losing their germinating power sooner than the others. So old seed will, in fact, produce fewer plants, but of the plants produced there will be a greater percentage of doubles.''

How far can we now believe this statement, made as long ago as 1765? According to traditional belief, it is better to use for some vegetables and flowers seeds from two to five years old. Why? Old gardeners say that new seeds produce plants less shapely, running more quickly to seed, and of such vigour that they do not preserve all their true characteristics, while seed two or three years old give more shapely plants, with less tendency to run to seed. I believe in this, and will try, if possible, to explain it.

All plants, or, I should say, most of them, have the power of reproducing themselves from seed, with their own characteristics, but at the same time they are influenced by atavism, which tries to make them revert to the specific types from which they came. Thus in the seed of some varieties two forces struggle—the one tending to make them revert to the primitive type, the other tending to reproduce certain acquired characters more or less fixed by selection. It is possible that this atavistic force weakens with the age of the seed, as also that abnormal vigour which makes certain plants run to seed if grown from seeds too fresh when sown. This is not the case with stocks. If we admit that double flowering of these plants is a weakness of degeneration, it is easily believed that seeds some years old no longer possess their pristine vigour, and can produce a double flower instead of a single. We have here a real transformation of the seed—a transformation which can be allowed if we remember that the less stocks are let run wild the more chance one has of obtaining double flowers. It is for this reason that stocks are grown in pots in Germany. In this way a much larger percentage of double flowers is obtained than in the case of plants grown in the open. Many growers prefer to use China aster seed one or two years old, saying that by so doing they get more double flowers. But, above all, it is in the kitchen garden that it is necessary to know whether to choose young or old seed according to the species or variety. Thus, for beetroot and carrots, seed two years old should be used to let the root form better and keep the plants from running; for chicory and cabbages three-year-old seed, as then the plants shoot and ripen better. If we do not wish to let spinach, lettuce, or radish run to seed, or differ from the type, we must use two-year-old seed. For corn salad it is necessary to use seed at least a year old, as seed gathered in June will scarcely grow if sown in the following September or October.

DISTRIBUTION OF CANE PLANTS.

We are informed by the General Superintendent of the Bureau of Sugar Experiment Stations that a highly successful free distribution of approved cane varieties was carried out at the Sugar Experiment Station, Bundaberg, on 18th February. The Chemist in Charge (Mr. Pringle) reports that upwards of 160 growers called at the station, and were supplied with new varieties, including Queensland 813, 970, 1098, Java, E.K.1, H.Q. 77, Shahjahanpur No. 10, and others. In addition to this, about 80 growers outside Bundaberg are being supplied by rail.

Tropical Industries.

THE SOUTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Southern Field Assistant (Mr. J. C. Murray):—

Throughout the month of February the cane-growing districts of Childers, Pialba, Maryborough, and Yerra have been visited.

CHILDERS.—This district has every prospect of a good harvest. The cane, both plant and ratoon, is still growing rapidly; and the farmers are paying careful attention to cultivating and the checking of weed growth. There is a general feeling of satisfaction in the district, the people considering the difficulties caused by the drought about at an end. Live stock and pasture land also look well, and unemployment is not so rife as in other centres. The returned soldiers are actively engaged in the question of getting Hapsburg and Lynwood Plantations resumed, which, if done, means that numbers of service men would have homes on some of the finest sugar-growing land in Queensland.

Speaking generally on cane varieties and methods associated with cane culture, there is nothing outstanding to comment upon. The 1900 Seedling and D.1135 are still the staple varieties, although Q.813 is beginning to find considerable favour amongst the growers. A row of this cane planted by Mr. F. Perske, in a field of 1900 Seedling, has made good growth, outstripping the Mauritius variety, notwithstanding they were both planted at the same time in the autumn of 1920.

Cane pests are not troubling the growers much, although large numbers of beetles have been observed flying at different periods during November and December. In the case of possible grub attack in the late autumn, the growers have been recommended to use arsenic.

A short visit was paid to Booyal. Very little cane is grown there now, the farmers following other pursuits. The soil, however, is good; and, with the exception that light frosts occur now and again, the district is suitable for cane-growing. Varieties that have been introduced to Booyal include Badila, Goru, D.1135, Rappoe, Black Innes, Mahona, H.Q. 426, Cheribon, Striped Singapore. Of these, Rappoe, Striped Singapore, and D.1135 did about the best. Heavy tonnages have been obtained at Booyal, and could be again grown if farmers took planting up again seriously.

Dallarnil was also gone over. A little cane is at present being grown, though more is now being planted. D.1135 is the principal variety, the farmers being satisfied that this is the best cane for the Dallarnil district. A drawback here is the distance from the mill.

PIALBA.—Judging by the general appearance of the cane, the harvest should be the best that has occurred for some years. Much of the ratoon cane is backward, but the plant crop looks well and should give a good return.

With regard to most of the cane that has been ratooned around Pialba, it would be as well, after the cutting, if the farmers were to plough out the old stools and give the soil a green manure crop before replanting; also, if possible, the soil should be limed. If measures are not soon taken, much of the land will not be worth planting.

A shortage of organic matter and, on acid soil, reaction are noticeable on many of the Pialba soils. The latter is sometimes due to bad drainage. The bulk of the spring water is charged with magnesia. Good rains have fallen at Pialba during this year, and live stock look well. Generally speaking, there is nothing outstanding to remark upon since last visiting Pialba. D.1135 is the staple variety. This cane is now showing considerable signs of deterioration, and requires careful selection and planting.

MARYBOROUGH.—This district has been benefited greatly by the recent rains and subsequent good growing weather. The plant cane is making rapid growth, and farmers who are still making a livelihood out of sugar production are looking forward to a fair harvest.

Of the many varieties that are growing in this district, which is one of the oldest in Queensland, D. 1135, 1900 Seedling, Rappoe, and Striped Singapore look about the best. The two latter canes are in some cases especially vigorous. They should be kept under observation for gumming, however. Green manuring, liming, and thorough cultivation would ensure more profitable returns on many of the farms in this area.

Tinana Creek and the Mary River are fine waterways. They are availed of to a certain extent by the cane-growers for transport to the mill. This method is cheap and effective, and better facilities for carrying out this work would bring about greater efficiency and more comfort for all concerned.

YERRA.—Although, with one or two exceptions, the areas planted here are very small, the farmers seem more encouraged to produce than they have done for a long time. The cane looks healthy, and tonnage returns per acre should be well up to the average of other districts. Some farmers have done a fair amount of clearing, either for the purpose of introducing grasses or cane-growing. Mr. N. Jacobsen has been doing something in this respect recently, and is now busy planting with the mattock. The land cleared was covered with dense scrub, and is a light porous loam, with a clayey loam subsoil. The variety to be planted is principally Q. 813. The chief drawback the farmers on the low-lying portions have to contend with is the likelihood of frosts. These occur between May and September, if they do strike the district at all. As remarked in previous reports on Yerra, the roads leave something to be desired, but still there has been a considerable improvement lately.

RUBBER.

The "Journal of the Jamaica Agricultural Society" writes:—

The future prosperity of rubber is obviously entirely a question of the relation between supply and demand.

During the last five years, the production and consumption of rubber have kept pace, both increasing at the rate of 50,000 tons per annum; but the forecast is that no such increase of rubber can be expected after this year.

During the war large stocks accumulated at the places of production, for want of freight to transport the rubber to the markets. Yet practically all these stocks have been already absorbed in addition to the 1919 output.

The output from the world's rubber trees of Amazon Valley has been largely decreased owing to the impossibility of marketing the rubber during the war, and the industry there is disorganised. But, of course, the trees are there; and whether this trade will ever resume its former importance depends upon the price, which would require to be high now to pay the very largely increased expense of gathering.

Then, again, the revolutionary wars in Mexico have destroyed many of the large plantations of Castilloa rubber there, and work on practically all has been stopped for half a dozen years. Meanwhile, the plantations in the East are highly organised and go on paying large dividends.

It seems that if the consumption of rubber goes on increasing as it is steadily doing, largely owing to motor transport, there will be a rubber shortage in the near future.

There were great hopes in Germany once of their chemists producing a synthetic or artificial rubber which would largely replace natural rubber. This hope is not now held. The Germans planted largely of rubber in their West and East African Colonies, more especially in the Cameroons, and they interplanted it with cocoa trees where conditions suited both. Sometimes they interplanted oil palm too; but this was overdoing it, and the cocoa did not stand two shade trees. But, as a rule, the cocoa and rubber have done well together. The rubber of West Africa is mostly Funtumia, native to West Africa, but there is also Hevea.

Whoever has rubber trees here should hold on to them. The latex is cumulative; that is, the ability of the tree to produce more and more increases with age, and some day many of the trees here will be tapped to great advantage if a big demand at a high price suddenly occurs, and will probably produce £2 or £3 value each, which, if it happens at a time when other products are low, will come as a boon to many. History repeats itself. Records show that there have been times here when estate-owners have chopped down cocoanut trees because of the low price of the nuts, and planted bananas; have chopped out large bearing cocoa trees in the same way, only to replant a few years later when the price of bananas was low over a few years. We remember when logwood trees were advocated to be cut out, as there was little demand and they interfered with the growth of grass for cattle. How different now!

At present practically everything is subordinated to sugar-cane; and we fear that there may be such a craze that cocoanuts, cocoa, rubber—every tree that stands in the way of cane—may be chopped down. But hold on to mixed cultivation; the history of our products show that every one has its ups and downs. Plant cane by all means where land is free, and even sacrifice part of pasture and bananas, which are quickly established again if necessary; but it is a sacrilege to chop down a good economic tree for the sake of sugar-cane.

RUBBER FINANCE PROBLEM IN INDIA.

Speaking at a rubber company's annual meeting, Mr. R. F. McNair Scott made an interesting contribution to the discussion on the rubber position. In the course of his speech he remarked:—

"The rapid and unexpected fall in the price of rubber during the last few months has forced us to recast our ideas as to cultivation, equipment, &c.; and, both by mail and cable, instructions to exercise the utmost economy, compatible with the safeguarding of the estates, have gone out with increasing emphasis as the price of rubber fell to, and then below, the cost of production. This fall is admittedly largely due to America's present inability to use rubber contracted for ahead. It is difficult to believe that the great American manufacturing organisations, who are now reselling rubber at less than half the price at which they were eager buyers a few months ago, can have completely misjudged consumption in its broad aspects; their and our troubles seem rather caused by a temporary dislocation in finance. The general malaise due to crushing taxation and disturbed exchanges found the rubber industry more vulnerable than most, as it is still in process of organisation to deal with a rapidly increasing mass of rubber, now some ten times the world's production of less than twenty years ago.

"Speaking broadly, we, the producers, finance rubber during its growth and transport to market—a period of years. The manufacturers have to finance the rubber during its manufacture and sale—a period of months. Between producer and manufacturer stands the dealer who has normally to finance for a period of days. If the financial arrangements of the manufacturer break down, whether this breakdown be brought about or aggravated by his money being locked up in factories planned to meet an anticipated increase in consumption; or by planting up large areas of rubber —an activity which incidentally he might have left to us, the growers; or through general depression by the temporary failure of consumers to take up their requirements, its effect on the dealer, with a normally revolving finance of short duration, is profound.

"The remedy seems to be for us growers to increase for a time the period for which we have to finance rubber. Unfortunately, as individual companies, we have not yet (harried as most of us have been by the tax collectors) been enabled to build up our reserves sufficiently to do this. Hence, although admittedly the difficulties are great, concerted action seems essential if we are to obtain the necessary financial assistance from outside. Such concerted action can only find stability on the tripod of cordial co-operation, reliable information, and adequate finance. The last would be forthcoming if growers provide the first two requisites. The obvious first step is to lessen the amount of the commodity to be financed, and this has been by a general agreement to reduce normal output by 25 per cent. But such agreement should be universal, and it may be desirable that the F.M.S. Government should take a hand in enforcing reduction. It is urgent that action should be prompt and decided, for so far you have nothing to persuade consumers that the turn has come. If their confidence were restored by the knowledge that reduction would be enforced, and, if necessary, increased, market conditions would change rapidly."—"The Planters' Chronicle," Madras.

SYNTHETIC RUBBER: ANOTHER FAILURE.

Germany during the war was practically without raw rubber, and it can be well understood that the urgent necessity for some substitute would command the attention of all the chemical science which that nation is known to possess. We have recently heard some remarkable stories about the invention of synthetic rubbers which would revolutionise the rubber trade. With the experience of so many similar projects in the past, we are always sceptical of the claims made by inventors of synthetic rubber, and we are not at all surprised to learn that at the annual meeting of Friedrich Bayer Farbenfabriken Co., it was stated that for the present all hopes which had been pinned to synthetic indiarubber had been abandoned, owing to the ever-increasing price of raw material required for its manufacture.

As already recorded, it is quite possible to make synthetic rubber which complies with the chemical analysis of the raw material, although the resulting material has never been satisfactorily proved to have the life of the natural article, while the cost of production of synthetic rubber has always so far been greatly in excess of Nature's product.

It is estimated that some 120 millions of British capital are invested in the plantation rubber industry. There are something like 3,000,000 acres under plantation rubber. The output of plantations last year was over 300,000 tons, and this year it is estimated to be some 360,000 tons. Compare this present rate of production with the output of 145 tons fifteen years ago!—"Journal of the Jamaica Agricultural Society."

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No. 21.

GOOSEFOOT (Chenopodium triangulare, *R.Br.*)

Description.—A straggling herbaceous plant, leaves and stems light green, the older ones often reddish, the younger ones covered with a white meal. Leaves on a leaf stalk (petiole) as long as the blade; blade hastate or triangular usually under 1 in. long, and as broad or nearly as broad as long. Flowers very small, in distant clusters along terminal or short axillary spikes. Fruit (''seed'' in the popular sense) small (about ½ a line in diameter), black and slightly rough, perianth segments of the flower more or less persistent and appearing as five white raised lines on the lower half of the fruit; seed dark black.

Distribution.—A common weed in Southern Queensland and in New South Wales. It is not found outside of Australia.

Common Names.—''Goosefoot'' is an English name commonly applied to different species of Chenopodium. It also goes under the name of ''salt weed'' or ''salt herb''—names applied to allied plants, principally to *Atriplex semibaccata.* Sometimes it is called ''fat hen''—a name, however, more often applied to taller growing plants of the genera *Chenopodium* and *Amarantus.*

Botanical Name.—Chenopodium from the Greek *chen, chenos,* a goose, and *pous, podos,* a foot, being simply a translation of the local name given on account of the shape of the leaf of many species; *triangulare,* Latin alluding to the triangular shape of the leaf blade.

Properties.—Some few years back specimens of this weed were forwarded by Mr. F. J. Watson, Dairy Inspector, Maryborough, as a plant eaten by dairy cows, tainting their milk and causing a ''fishy'' flavour in the butter subsequently made. Recently specimens were sent by Mr. A. R. Wilkin, Instructor in Cheesemaking, with the report that the plant grew profusely in parts of the Burnett district, and had the property of tainting the milk of cows consuming it.

Apart from this property the plant is evidently a valuable forage, as in March, 1919 (during the drought period), Mr. A. F. Kentish, of Tara, *viâ* Dalby, sent specimens taken from a two-year-old haystack, and stated that in the hay form his stock had been eating it in preference to other feed. A small sample of the hay was handed over to the Agricultural Chemist (Mr. J. C. Brünnich), who reported that the plant appeared to be a very valuable fodder, and gave the analysis as follows:—

Analysis.	Hay. Dry Material. Per cent.	Hay. Green Material. Per cent.
Moisture	8.29	50.00 (assumed)
Crude protein	16.62	9.06
True protein	10.25	5.59
Carbohydrates (by difference)	32.27	17.59
Fibre (crude)	22.63	12.34
Ether extract	2.19	1.19
Crude ash	18.00	9.81
Lime	1.18	0.64
Phosphoric acid	0.39	0.21
Nutritive ratio	5.1	5.1
Starch value	46.1	25.2
Starch equivalent	23.9	43.7
Protein equivalent	24.7	45.3

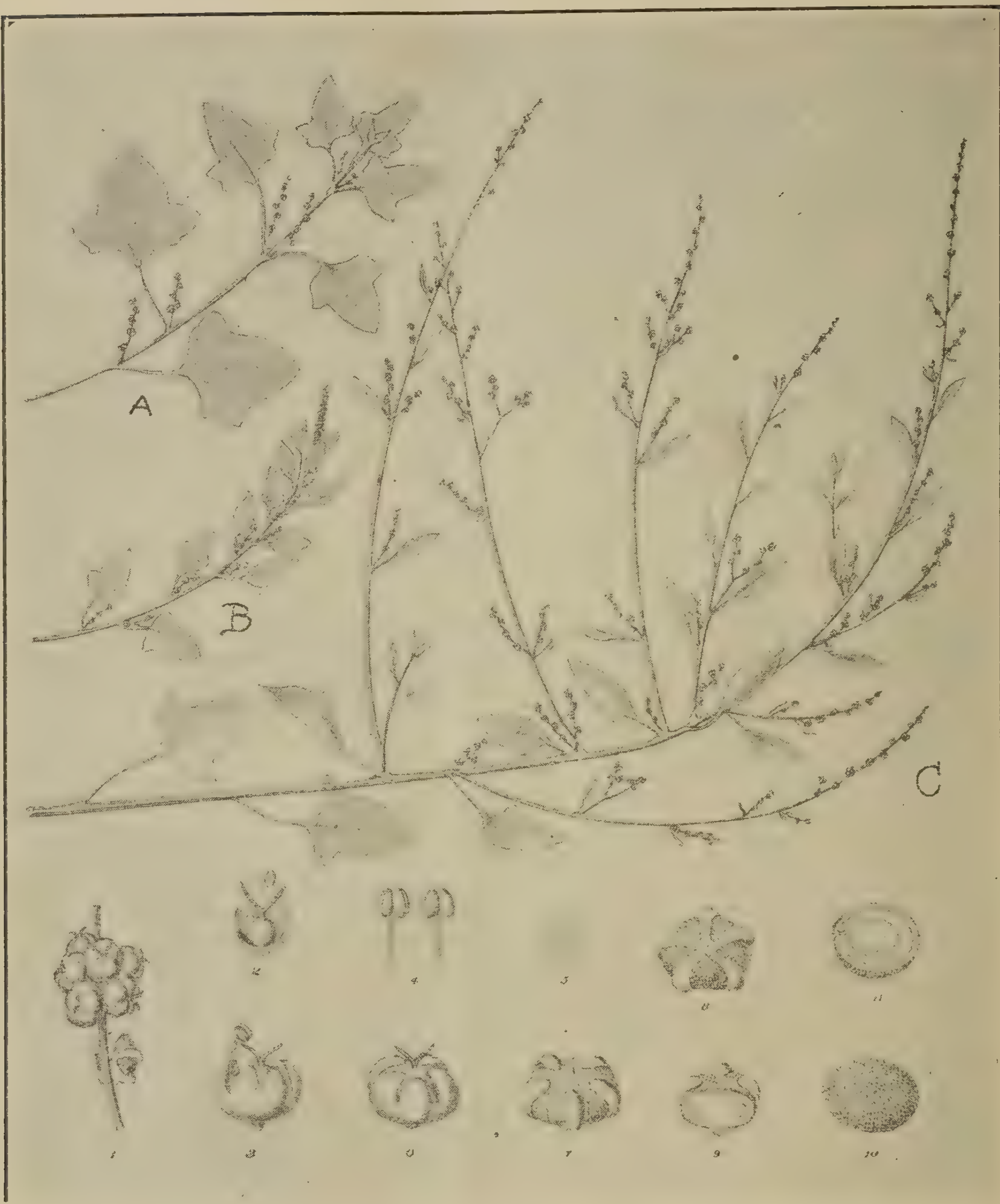


PLATE 19.—GOOSEFOOT (*Chenopodium triangulare*), R. Brown.

A, B, and C.—Shoots somewhat reduced.
1.—Portion of branchlet bearing flowers.
2.—A flower, part of the calyx removed.
3.—A flower.
4.—Back and front view of a stamen.
5.—Pollen grain.
6.—A young fruit.
7 and 8.—Mature fruits (seeds).
9.—Longitudinal section of a fruit.
10.—A seed.
11.—Transverse section of seed.
1-11.—Variously enlarged.

(After Mueller in "Iconography of Australian Salsolaceous Plants.")

Forestry.

QUEENSLAND TREES.*

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Government Botanist.

No. 1.

SCRUB IRONBARK (Bridelia exaltata).

Common Name.—Scrub Ironbark.

Derivation.—*Bridelia,* after Professor Bridel, an early worker on mosses; *exaltata,* Latin, lofty.

Description.—A tree attaining a height of about 100 ft. and a barrel diameter of about 2 ft. Barrel not prominently flanged. Bark dark brown in colour and prominently furrowed or fissured; when cut it is seen to be red internally, and measures about ½ in. in thickness on a tree with a barrel of 2 ft. diameter. Sapwood, white; heartwood, light brown. Leaf stalks, ⅛ to ¼ in. long. Leaves, alternate, narrowly egg-shaped in outline, narrowed at the apex, with prominent lateral nerves and net veins especially on the underside, upper face somewhat glossy, under surface paler and duller; measurement of leaf blade, 1½ to 2½ in. long, twice to three times as long as broad; the leaves on coppice ("sucker") shoots and young trees are often much larger. Flowers small, in small clusters of about 6 or less in the forks of the leaves or at the scars of fallen leaves. Fertile male and female organs in separate flowers; the two sorts of flowers often on the same tree and in the same cluster. Stalks of individual flowers one-twelfth of an inch or less in length. Individual flowers about a-quarter of an inch or less in diameter when expanded, consisting of 5 triangular calyx lobes, 5 small petals inserted between the calyx lobes and shorter than them; and in male flowers, 5 stamens about one-tenth of an inch long surrounding an abortive ovary; in female flowers an ovary, which generally develops into the fruit. Fruit, globular, yellow when fresh, turning brown, about one-third of an inch in diameter, with a fleshy outer coat surrounding a "stone," which is generally 2-celled, and when ripe contains one seed in each cell.

Flowering period (?); in fruit from March to June.

Distribution.—Confined to Australia. Coastal scrubs of Southern Queensland and Northern New South Wales. Our northermost locality record at present is the Gympie district. It is common in the remnants of "scrub" (rain forest) about Brisbane, in the Goodna scrubs, and in the drier "scrubs" of the Beaudesert and Canungra districts.

Uses.—R. T. Baker ("Hardwoods of Australia," page 356) states that the timber is not uncommon on the Sydney market, and that it is suitable for carriage and coach parts, shipbuilding, and general constructional work.

Notes.—The tree is very common in some localities as secondary undergrowth in paddocks and as the leaves, like those of young sorghum and some other well-known plants, contain a prussic-acid yielding glucoside, they may, if eaten in quantity by stock, produce death, though no actual losses due to the plant have been recorded.

The ripe berries, which are generally produced in great abundance, are greedily sought after by fruit-eating birds.

References.—*Bridelia exaltata,* F. v. Mueller, in "Fragmenta Phytographiæ Australiæ," Vol. III. (862); Bentham, "Flora Australiensis," Vol. VI., page 119; F. M. Bailey, "Queensland Flora," Part V., page 1410; R. T. Baker, "Hardwoods of Australia," page 356, pl. 116, and fig. lxxviii. (The generic name is sometimes spelt *Briedelia.*)

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* Under this heading it is decided to give from month to month popular descriptions of some of our native trees. After a number have been published, it is hoped, should opportunity permit, to issue the matter along with illustrations and descriptions of other species in book form.

The descriptions are as void of pure technicalities as possible, and have been drawn up from fresh material or from specimens preserved in the herbarium collections of the Department.

PLATE 20.—SCRUB IRONBARK (*Bridelia exaltata*), GOODNA SCRUB.

PLATE 21.—SCRUB IRONBARK (*Bridelia exaltata*).

A.—Large leaf from young coppice growth.
B.—Fruiting twig.
C.—Flowering twig.

Science.

SEED ELECTRIFICATION.

Experiments that may be accepted as fairly conclusive have been carried out in Great Britain to test the effect of the electrification of seed.

This process consists in immersing the seeds in a solution of common salt and water (4 oz. to the gallon), or calcium chloride and water (8 oz. to the gallon), to which an electric current is then applied. The seeds are dried 100 degrees Fahr., and are then ready for sowing.

The tests were made with seeds of mangold, swede, cattle cabbage, and carrot; and two distinct series were arranged—a germination test and a field test.

The conclusions arrived at are:—

"*Germination.*—Notwithstanding the one or two points which seem to be slightly in favour of the electrified seed, the results obtained by this series of tests can only be regarded as inconclusive.

"*Field Test.*—The outdoor tests, as a whole, would appear to be no more conclusive than were the tests for germination, the returns from the electrified seed showing no advantage over the other sections, except to a small extent in the case of mangold.

"It will be seen that the results are of an inconclusive nature, and would not seem to justify the employment of the process.

"The failure of electrified seed to give any increase in yield under the carefully controlled conditions of an experimental station trial shows that the process lacks certainty. It cannot be compared in effectiveness with manuring, which succeeds nearly every time when properly done. The writer (Dr. Russell) is not prepared, on present evidence, to say that the process will succeed, but the risk of failure seems so great that the farmer should look upon it as an adventure which may or may not be profitable."—"New Zealand Farmer."

WHAT IS COBALT?

It was lately announced in the daily newspapers that a valuable outcrop of cobalt had been discovered near Cloncurry, and it was stated that the value of cobalt was higher than that of molybdenite during the great war. We have been asked by a correspondent to give some information concerning cobalt and its uses. Metallurgists tell us that cobalt is a metal, and is one of the only three metals which are attracted by the magnet, and can become magnets themselves—viz., iron, nickel, and cobalt; but they cannot retain their magnetism as does the compound metal "steel." The colour of cobalt is reddish grey; it is brittle and difficult of fusion. Generally, it occurs combined with arsenic, and associated with nickel and iron. Its oxides, on account of their brilliance and permanent colour, are of importance in the arts, such as in the manufacture of glass, to produce the beautiful blue varieties called "smalt." At times it is a substitute for nickel in plating goods, and as an enamel, and in pigments generally. The reported discovery at Cloncurry should be a valuable one.

HOME-MADE SHEEPSKIN RUG.

With the approach of winter come inquiries as to the preparation of fur and wool skins for mats and rugs. To prepare a sheepskin is not very difficult. Take a fresh skin, clear it of any dirt and wash the wool in slightly warm soap suds, to which you have added a tablespoonful of kerosine oil. Then wash in fresh suds until the wool looks white and clean. Put it in sufficient cold water to cover it and dissolve ½-lb. each of salt and alum in three pints of boiling water. Pour this over the skin side, and rinse it up and down. Let it soak in this for 12 hours, then hang up to drain. When nearly dry, tack it, wool side in, on the wall of the barn to dry. Now rub into the skin 1 oz. each of pulverised alum and saltpetre, or double this if the skin is large. Rub for an hour or two. Fold the skin sides together, and hang away for three days, rubbing every day, or till perfectly dry. Then, with a blunt knife, clear the skin of impurities, rub it with pumice, or rotten stone, trim into shape, and you have a warm rug which should last a life time.

General Notes.

TO TAN A HIDE FOR WHIP-MAKING.

To make a stock whip of kangaroo hide, the hide must be tanned; but if of calf or bullock hide, tanning is not necessary. To tan a skin, the general principle is to trim off the useless parts of the skin, and remove all fat from the inside. Then soak the skin in warm water for about an hour, after which apply a coating of borax, saltpetre, and Glauber's salts—1 oz. of each dissolved in sufficient water to make a thin paste. On the following day give a coating of a mixture of 1 oz. of sal. soda, ½ oz. of borax, and 2 oz. of hard soap. This mixture should be slightly heated without allowing it to boil. After this, fold the skin together and leave in a warm place for twenty-four hours. Then take 4 oz. alum, 8 oz. salt, and 2 oz. saleratus; dissolve in hot water, and when cool soak the skin in it for twelve hours. Wring out and hang up to dry. If the skin is not sufficiently soft after this, the soaking and drying must be repeated two or three times. Another method is to wash the skin in a solution of sal. soda and water. Then take 4 oz. powdered alum, 8 oz. salt, 1 quart new milk to 4 gallons salt water, and 1 pint prepared starch; stir well, then put in the skins, and air them often by hanging them over a stick laid across the tan tub. Handle them occasionally until they have been in the solution a day or two. Then remove the skins and add to the liquor a half teaspoonful of sulphuric acid. Stir this well in. Put the skins back, and steam them well for about an hour. Then wring out the skins in lukewarm water, and hang them up in a cool place. When they begin to get white, work and stretch them till dry. Hides of animals larger than kangaroos should remain longer in the solution.

When making a whip of calf-skin or bullock hide, use the hide green. Soak it well, shave off the hair and underside with a sharp knife, and stretch well after cutting into strips of the required size.

To Remove the Hair or Wool before Tanning.—First wash the skins thoroughly in water; then place them one above the other with the flesh side up. Then saturate each skin on the flesh side with a thick cream of lime, after which double them with the hairy side out. Let them remain thus for twenty-four hours, when the wool or hair should be loose; remove them and leave them to soak in weak lime and water. Remove them twice a day, and stir up the liquor before replacing them. Continue this treatment for three days, after which place them in a stronger lime liquor, and draw daily as before. In seven days, whatever hair has been left on should be easily removed. The next step is unhairing and fleshing—that is, the scarf skin and remaining hair are removed with a blunt knife, and all fat and flesh is taken off with a sharp one. Lastly, soak the skins well in some preparation of ammonia to convert the lime in the pores into soluble salts, which may then be removed by washing and scraping.

RATS EATING MATCHES A CAUSE OF FIRE.

Commenting on a paragraph in last issue of the Journal, Mr. Daniel Jones contributes the following interesting notes on this subject:—

"As bearing on the statement in your March issue *re* fires caused by rates, may I be allowed to tender my own experience on this question? Some years since, while engaged in fruit-growing not far from Brisbane, I had occasion one morning to open a drawer in my writing desk and, to my surprise, found much of the contents singed and some documents burned up. On closer search as to the then unexplained cause of the fire, I found a dead rat among my papers. As there were loose matches in the drawer, no other conclusion could be come to but that the rodent had squeezed itself into the closed drawer and, in the act of eating matches, ignited some and caused its own death.

"Previous to this, I had often regarded the possibility of rats causing fires with some doubt; but having direct evidence as in my own case, I am quite ready to credit some fires at any rate to the activity of rats or mice. Fortunately, the confined space in which the fire started, precluded further spread; hence, instead of having a conflagration involving loss my luck saved the situation."

FOOT-AND-MOUTH DISEASE.

INTRODUCTION FROM ABROAD.

The way by which foot-and-mouth disease is brought into Great Britain and similarly situated countries from time to time, notwithstanding the fact that into the former in particular the importation of susceptible live stock is prohibited, is as mysterious as it is interesting. The subject has given rise to spasmodic discussions, but the possibilities do not seem to have been methodically debated in relation to the actual facts, so far as they are known.

It may be accepted as established that Great Britain freed from the disease in enzootic form is only invaded when the disease is prevalent on the Continent, particularly when it prevails in the north of France, Belgium, and Holland. In the light of recent experience, it would also appear that the greater the prevalence, the more frequent are the invasions.

Live stock being excluded as a factor, it is not unnatural that suspicion should have fallen upon human beings coming from the Continent where the disease is raging, and on imported feeding stuffs and litter. It may be mentioned, however, to save further discussion, that the importation of hay and straw, except for exceptional purposes, has been prohibited since 1908, and that the position as regards foot-and-mouth disease has not apparently been modified in consequence.

Whether Disease is Communicated by Feeding Stuffs, Packing Materials, and Human Beings.—These represent the communications between animals of the farm and the outside world, and it is not unnatural that they should have fallen under a sustained suspicion. The object of the inquiries which have been made over a period of years was to find whether any credible factor repeated itself in a number of outbreaks, or whether any lines of evidence from a series of initial outbreaks would converge on one point, for example, on a cargo or consignment of feeding stuffs, &c. It may be said at once that it has not been possible to establish anything of the kind. It is true grave suspicion has sometimes rested on a certain article, mainly on account of its advent synchronising with the appearance of disease on the premises, but in almost every case further inquiry has shown that the same consignment has been distributed to many other premises where no disease has occurred. It is also correct that an occasional outbreak arose near camps in which soldiers from the Continent had been concentrated. On the other hand no actual communication was established between the soldiers and the premises which became infected. Moreover, initial outbreaks had been known to occur in the past in the same locality when there were no soldiers or other persons to suspect, and in the vast majority of cases no outbreaks arose near camps of the kind.

The most that can be said of the above evidence is that it is not in favour of the view that infection is generally brought to this country by men and such articles as have been mentioned, but in addition there is the fact that many initial outbreaks have occurred on premises far removed from others, the animals of which having received only foodstuffs grown on the place, and the attendants not having been off the place for weeks before disease appeared. The weightiest evidence, however, against men, foodstuffs, &c., being responsible for the importation of initial infection has arisen in the last year or so, during which the invasions have been exceptionally frequent. It will be shown later that invasions have repeated themselves during the last twenty years in more or less defined areas of the country, though not on the same premises, large parts of England and Wales, and the whole of Scotland and Ireland having escaped entirely or almost so (there has been one initial outbreak in Scotland, at Edinburgh, in the last twenty years). These immune areas receive the same class of foodstuffs, &c., and are visited by the same class of human beings, and it is almost inconceivable that over a period of twenty years certain areas could receive all the infected persons and things which came into the country, and others escape entirely, if persons and foodstuffs are generally responsible for the importation of infection. This is all the more remarkable when it is remembered that in over 80 per cent. of the outbreaks of anthrax, infection is conclusively shown to arise from imported feeding stuffs and manures, and that the outbreaks follow the lines of distribution, sparing no parts of the part of the country in which they are used, Scotland for example, being as heavily hit in proportion as England.

If, then, the usual communications between the animals of the farm and the outer world do not account for the conveyance of something—virus of foot-and-mouth disease in this case—which arrives on farms with a certain amount of frequency, other possible methods of communication must be considered, even if they appear at first sight fanciful.

Air-borne Virus.—No support having been found for the ordinary methods of conveyance of virus, it seems justifiable to explore the possibility of the virus being air-borne for long distances, either by air currents or birds, or otherwise. As regards

air currents, when affected cattle are allowed to remain alive on open pastures or at work, as is customary on the Continent for example, it is no uncommon thing to see strings of viscous slobber from the mouth whirled up into the air and dispersed into minute parts which disappear from sight. This material is known to be infective in infinitesimal doses, and it can therefore stand a high dilution. What becomes of it after it gets into the air is obviously a question which cannot be answered definitely. It is a fact, however, that even in this country where the official method of handling diseased animals—housing and almost immediate slaughter—gives few opportunities for virus to spread, ramifications in the direction of a strong prevailing wind have been occasionally observed to a distance of a few miles, and no ordinary communication could be traced by the minutest inquiry. Having regard to the distance which volcanic dust can be borne in the air it seems reasonable to believe that very small particles of infected mucus could be carried long distances by air currents, even in clouds, and be washed down in rain. The experiments of Blackley which showed that the air may be heavily charged with grass pollen, and that it might be carried thus as far as from Norway to this country, are of some interest, and it may be remarked that pollen from pastures in infected countries might be contaminated.

Accepting air-borne virus as possible, the next question which arises is, whether there exists more frequently anything in the form of air pockets of negative pressure in the areas mostly invaded, which could account for the suspended virus descending to earth or water. These are problems which obviously should be discussed with those who are now exploring the air. As regards birds, it immediately suggests itself that if birds in general are responsible, there should be definite periods of invasion, given prevalence of disease in other countries, which synchronise with those of the migration of birds inwards. There are two migratory seasons, during both of which birds arrive in or leave this country. In the autumn certain birds leave to winter elsewhere. These can be disregarded as importers. Others arrive to winter in this country. These can probably be disregarded, as most of them come from the North where the disease seldom prevails. In the Spring months birds come in mainly from the South for breeding purposes, and might be carriers whilst others depart for the North.

In going back over the outbreaks in the period of twenty years, however, it appears that the lowest records of invasion are March—4, April—1, May—0; July, in which there is no migration, shows 8. September, October, and November, when birds may be expected from the north and north-east, which are not the lands of prevalence as regards foot-and-mouth disease, show respectively 7, 7, and 4, while December, during which there is practically no migration inwards, shows 9.

These data are against the suggestion that there is any general relation between migration and invasion by foot-and-mouth disease. They do not, however, exclude the agency of those birds, such as ducks, geese, and gulls, which may, outside the migratory seasons, travel long distances for food. For purposes of closer investigation it might be assumed:—(*a*) that such birds might in their travels frequent contaminated pastures or drinking places and afterwards deposit virus in this country from their feet or plumage; (*b*) that they might swallow infected material, such as water and food contaminated by slobber and pieces of membrane from the mouths of cattle, and afterwards excrete the virus in a still active state. It is hoped that experiments which are to be conducted on the viability of the virus may determine the possibilities as regards (*a*) and that as regards (*b*) feeding experiments with the virus, using birds, may at least show whether the virus can pass through their intestines unchanged, and render their excretions infective for lengthy periods.

As the matter stands at present, however, the evidence, such as it is, is most in favour of particles of virus being carried by the air.

A NEW VARIETY OF CORN.

By the process of hybridisation (writes the "Queensland Times" of 18th March), Mr. A. W. Morris, teacher at Tipperary Public School, Young (N.S.W.), has produced a variety of maize which he believes will go a long way towards solving the problem of maize growing in comparatively dry districts such as Young (says the "Chronicle"). It will also be of value in districts like the coast, because it ripens as early as the Ninety Day, but has the advantage of giving a much better yield. First of all, Mr. Morris crossed Early Dent with Silvermine, and then the result of that cross with Ninety Day. In this way he produced a variety which has a small stalk like the Ninety Day, but cobs fully 1 ft. long and grain ½ in. deep. The cobs are thin, thus having more room for grain, and the grain is very closely packed. This corn was sown on 14th October and harvested on the 14th of last month; so that it had practically no rain during the whole period. Mr. Morris had about a quarter of an acre of it this season.

THE TOBACCO-GROWING INDUSTRY.

Since the departure of the late W. Neville in 1913, who for some time supervised the cultivation of tobacco at Texas (Q.), Bowen, and Cardwell, and the preparation of the crops for market, the industry languished, and for the past few years the area under this crop has much diminished. The drop in that time has been from 731 acres to 321 acres in 1919. At Bowen the tobacco industry is mostly in the hands of Chinese, and the decline there has not been so marked as at Texas. For this year, however, the area under tobacco at Texas has been largely increased, and it is anticipated that the season's crop will yield fully 100 tons, the rains having been very beneficial to the plants. The main difficulty in overcoming the hesitation of Europeans to cultivate this crop appears to lie in the close attention needed during the growing season and in the curing.

JOURNAL OF SCIENCE AND INDUSTRY, MELBOURNE.

We much regret to learn that it has been decided by the Executive Committee to suspend publication of the Official Journal of the Commonwealth Institute of Science and Industry. We have read with much pleasure and profit the several well-written scientific articles appearing in it monthly, some of them having been republished in the "Queensland Agricultural Journal." We note that the suspension of its publication is preliminary to an expansion of the work of the Institute, when a Director will be appointed, pending which the interim reports of various committees of inquiry will be communicated to the daily and technical press of Australia, and, when necessary, special statements will be prepared and circulated among persons particularly interested in the work in hand.

HOW TO KEEP LEMON JUICE FRESH.

Lemon juice may be bottled and kept indefinitely if it is strained into small bottles that have been sterilised and allowed to become perfectly dry. Fill nearly full with juice, put a teaspoonful of olive oil on the top, and cork tightly. Keep in a cool dark place. When ready to use, run a piece of clean cotton into the bottle to absorb the oil. The juice will be found to be as fresh as if it had just been pressed from the lemon.—"Garden and Field."

POULTRY AND EGGS DURING EASTER.

According to reports in the daily Press, it is anticipated that there will be a fall in the price of poultry, and an advance in the price of eggs with the advent of the Easter holidays. Towards the middle of March reports from various country centres indicated that large numbers of poultry would be on the market in the near future. There is already a limited demand for turkeys, but prices will in all probability advance for these. Some agents consider it would be advisable for poultry-breeders to take advantage of a bare market and sell while prices are good.

SOCIETIES, SHOW DATES, ETC.

BOROREN.—Bororen and Miriam Vale Agricultural and Pastoral Society. Secretary, James Crawford. Show dates: 14th and 25th May, 1921.

INGHAM.—The show dates of the Herbert River Pastoral and Agricultural Association have been altered to 26th and 27th August, 1921.

GOONDIWINDI.—MacIntyre Pastoral and Agricultural Association. Secretary, J. S. Hall. Show dates: 26th to 28th April, 1921.

UBOBO.—Ubobo Farmers' Progress Association.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH, 1921.

Article.		MARCH. Prices.
Bacon	lb.	1s. 4½d.
Barley	bush.	...
Bran	ton	£10 10s.
Broom Millet	,,	£25 to £29
Broom Millet (Sydney)	,,	£20 to £40
Butter (First Grade)	cwt.	238s.
Chaff, Lucerne	ton	£10 15s. to £11
Chaff, Mixed	,,	£8 to £8 5s.
Chaff, Oaten (Imported)	,,	£8 to £9
Chaff, Oaten (Local)	,,	£6 to £7
Chaff, Panicum	,,	...
Chaff, Wheaten	,,	£6 to £7
Cheese	lb.	1s. 2d. to 1s. 3d.
Flour	ton	£19 17s. 6d,
Hams	lb.	1s. 8d. to 2s.
Hay, Lucerne	ton	£7 to £8
Hay, Oaten	,,	...
Honey	lb.	4d. to 4½d.
Maize	bush.	4s. 8d. to 4s. 11d.
Oats	,,	3s. 6d.
Onions	ton	£4 to £8
Peanuts	lb.	5d. to 6d.
Pollard	ton	£10 10s.
Potatoes (English)	,,	£3 to £9
Potatoes (Sweet)	,,	2s. 6d. to 5s.
Pumpkins (Cattle)	,,	£5 to £6
Eggs	doz.	1s. 1d. to 2s. 9½d.
Fowls	per pair	3s. 6d. to 9s.
Ducks, English	,,	5s. 6d. to 6s.
Ducks, Muscovy	,,	6s. 6d. to 9s.
Geese	,,	9s. to 11s.
Turkeys (Hens)	,,	12s. to 15s.
Turkeys (Gobblers)	,,	25s. to 40s.
Wheat	bush.	6s. to 7s. 8d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans, per sugar bag	2s. 6d. to 4s.
Beetroot, per dozen bunches	...
Cabbages, per dozen	4s. 6d. to 8s. 6d.
Carrots, per dozen bunches	1s. to 2s.
Cucumbers, per dozen	3d. to 1s. 6d.
Lettuce, per dozen	...
Marrows, per dozen	1s. 6d. to 3s. 6d.
Peas, per sugar bag	8s. to 14s.
Pumpkins (table), per doz.	2s. 6d. to 6s.
Rhubarb, per bundle	...
Sweet Potatoes, per sugar bag	1s. 6d. to 2s. 6d.
Tomatoes, per quarter case	2s. 3d. to 3s. 6d.
Tomatoes (inferior), per quarter case	...

SOUTHERN FRUIT MARKETS.

Article.	MARCH. Prices.
Bananas (Tweed River), per double case	7s. to 28s.
Bananas (Queensland), per double case	10s. to 23s.
Lemons, per bushel case	10s. to 14s.
Mandarins, per case	...
Oranges, per bushel case	10s. to 15s. 6d.
Oranges (Navel), per bushel case	...
Passion Fruit, per half bushel case	10s. to 11s.
Peaches	2s. 6d. to 6s.
Pineapples (Queens), per double case	6s. to 18s.
Pineapples (common), per double case	5s. to 7s.
Pineapples (Ripleys), per double case	5s. to 7s.
Quinces, per bushel case	3s. to 4s.
Tomatoes, per case	5s. to 7s. 6d.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per case	5s. to 6s.
Apples, Cooking, per case	3s. 6d. to 6s.
Bananas (Cavendish), per dozen	3d. to 6½d.
Bananas (Sugar), per dozen	5d. to 7d.
Bananas (Lady's Finger), second quality, per dozen	...
Citrons, per cwt.	8s. to 9s.
Cocoanuts, per sack	£1 5s.
Grapes, per case	5s. 6d. to 10s.
Lemons (Lisbon), per quarter case	4s. to 5s. 6d.
Mangoes, per bushel case	...
Oranges, per case	...
Papaw Apples, per tray	3s. 6d. to 7s. 6d.
Passion Fruit, per quarter case	7s. 5d. to 13s.
Pears, per half-bushel case	...
Peaches, per quarter case	1s. 6d. to 4s. 6d.
Persimmons, per quarter case	3s. 5d. to 5s. 6d.
Pineapples (Queens), per dozen	3s. 6d. to 5s.
Pineapples (Ripleys), per dozen	4s. 5d. to 7s.
Pineapples (common), per dozen	3s. 6d. to 6s.
Plums, per quarter case	5s. 6d. to 8s.
Quinces, per case	4s. 5d. to 7s.
Tomatoes, per quarter case	...

TOP PRICES, ENOGGERA YARDS, FEBRUARY, 1921.

Animal.	FEBRUARY. Prices.
Bullocks	£16 to £17 10s.
Bullocks (Single)	£20 5s.
Cows	£10 15s. to £11 2s. 6d.
Merino Wethers	26s.
Crossbred Wethers	27s. 6d.
Merino Ewes	20s. 6d.
Crossbred Ewes	27s. 9d.
Lambs	28s.
Pigs (Backfatters)	...
Pigs (Bacon)	...
Pigs (Porkers)	...

LONDON QUOTATIONS FOR TROPICAL PRODUCE.

Sisal hemp, per ton, £46. Rubber—Para, per lb., 11½d.; Plantation, per lb, 1s. 1⅝d. Copra, per ton, £33.

Farm and Garden Notes for May.

FIELD.—During this month, the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now at this work. Potatoes should be hilled up. Cut tobacco. The bulk of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Cotton-growers are notified that cotton-ginning and baling machinery has been installed on the premises of the Department of Agriculture and Stock in William street, where seed cotton will be received by the department from the growers, to whom an advance of 5½d. per lb. will be paid. The cotton will then be ginned, baled, and marketed in the best market, and whatever balance to credit is shown when account sales are received will be distributed amongst the suppliers according to the amount of cotton supplied by them. Only bare expenses of preparing the shipments and freight, if the cotton is exported, will be deducted. Thus it will be seen that cotton-growers will have a sure market for their produce. Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to their particular district and soil. A few acres of artificial grass, notably Rhodes grass, will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass in the West will carry ten to twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries should be pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Annetta, Phenomenal, Hautbois, and Trollope's Victoria. Aurie and Marguerite are the earliest. In some localities, strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

KITCHEN GARDEN.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned, pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus.

FLOWER GARDEN.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted; also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Orchard Notes for May.

THE SOUTHERN COAST DISTRICTS.

The advice given respecting the handling and marketing of citrus fruits in the last two numbers of this Journal applies with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed the better they will carry, and the better the price they will realise.

Continue to pay careful attention to specking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed, but destroy it by burning. Keep a careful lookout for fruit fly, and sweat the fruit carefully before packing. If this be done, there will be little fear of the fruit going bad in transit or being condemned on its arrival at Southern markets. Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required, just sufficient to keep moisture in the soil, keep down undergrowth, and prevent the packing of the surface soil by trampling it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered, and it need hardly be stated, what has been mentioned many times before, that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as if the ground is in good order they get established before the winter, and are ready to make a vigorous growth in spring.

Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon overtaken by trees planted later, that are set out under more favourable conditions. The land must be thoroughly sweet, and in a good state of tilth—that is to say, deeply worked, and worked down fine. If this has been done, it will probably be moist enough for planting, but should there have been a dry spell, then, when the hole has been dug and the tree set therein, and the roots just covered with fine top soil, 4 to 8 gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. In sound, free, sandy loams that are naturally scrub soils, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner; but if this is not found possible, then the sooner it is done after planting the better. If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to be well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 ft. apart each way, and seedlings at least 30 ft. apart each way.

Towards the end of the month cover pineapples when there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked—first, to retain moisture; and, secondly, to prevent injury from frost—as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures—such as meatworks manure when coarse, boiling-down refuse, farm manure, or composts—may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place; but quickly-acting manures should not be applied now.

THE TROPICAL COAST DISTRICTS.

May is a somewhat slack month for fruit—pines, papaws, and granadillas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchard clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and, though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this under the heading of the Southern Coast Districts being aqually applicable here.

THE SOUTHERN AND CENTRAL TABLELANDS.

Get land ready for the planting of new deciduous orchards, as although there is no necessity to plant so early, it is always well to have the land in order, so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elsewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district the growing of a crop of blue or grey field peas, or a crop of vetches between the trees in the older orchards, is recommended as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than 4 cwt. of phosphatic manure, such as Thomas phosphate, or fine bonedust, per acre. The crop to be ploughed in when in the flowering stage. The granitic soils are naturally deficient in organic matter and nitrogen, as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months, and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes over-large and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, where the skin is thicker, is even better for peel, especially if the skin is bright and free from blemish; scaly fruit, scabby, warty, or otherwise unsightly fruit is not suitable for peel, and trees producing such require cleaning or working over with a better variety, possibly both.

The remarks *re* other citrus fruits and the work of the orchard generally, made when dealing with the coast districts, apply equally well here, especially as regards handling the crop and keeping down pests.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1921.	Feb., 1920.		Feb.	No. of Years' Records.	Feb., 1921.	Feb., 1920.
North Coast.	In.		In.	In.	*South Coast—continued:*	In.		In.	In.
Atherton	9·29	19	6·42	7·11					
Cairns	14·83	38	18·34	18·73	Nambour	8·66	24	3·93	5·05
Cardwell	16·87	48	10·34	9·60	Nanango	4·45	38	0·86	0·60
Cooktown	13·53	44	7·28	14·62	Rockhampton ...	7·70	33	3·58	1·55
Herberton	7·42	33	3·08	5·12	Woodford	9·11	33	1·34	1·73
Ingham	15·44	28	13·35	11·97					
Innisfail	19·64	39	20·29	13·81					
Mossman	14·84	12	14·25	18·95	*Darling Downs.*				
Townsville	11·98	49	1·38	4·00					
					Dalby	2·97	50	0·26	0·68
Central Coast.					Emu Vale... ...	2·36	24	1·69	0·55
					Jimbour	2·98	32	0·14	0·73
Ayr	9·20	33	0·99	4·16	Miles	2·72	35	1·17	1·15
Bowen	8·80	49	3·88	0·77	Stanthorpe ...	3·38	47	1·97	1·57
Charters Towers ...	4·52	38	2·15	0·78	Toowoomba ...	4·44	48	1·71	0·70
Mackay	11·61	49	15·81	3·54	Warwick	3·01	33	1·71	0·80
Proserpine	10·75	17	15·25	3·07					
St. Lawrence ...	8·11	49	4·86	2·15	*Maranoa.*				
					Roma	3·11	46	0·36	4·08
South Coast.									
Biggenden	3·84	21	1·29	0·73					
Bundaberg... ...	6·34	37	0·72	0·32	*State Farms, &c.*				
Brisbane	6·33	70	1·07	1·04					
Childers	6·19	25	0·62	0·55	Bungeworgorai ...	2·95	6	0·53	3·30
Crohamhurst ...	15·03	25	3·82	3·85	Gatton College ...	3·05	21	1·07	0·18
Esk	5·66	33	0·42	0·79	Gindie	2·88	21	0·44	0·73
Gayndah	4·23	49	0·88	0·25	Hermitage ...	2·52	14	1·50	0·80
Gympie	6·68	50	2·59	1·85	Kairi	6·47	6	Nil	8·10
Glasshouse M'tains	8·90	12	2·16	2·56	Sugar Experiment Station, Mackay	10·27	23	16·41	3·06
Kilkivan	5·13	41	2·04	0·18					
Maryborough ...	6·60	49	2·00	1·22	Warren	4·86	6	0·93	1·40

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for February, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.
AT BRISBANE.

1921.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·22	6·42	5·41	6·20	5·58	5·46
2	4·58	6·45	5·22	6·41	5·41	6·19	5·58	5·45
3	4·59	6·45	5·23	6·41	5·42	6·18	5·59	5·44
4	4·59	6·46	5·24	6·40	5·43	6·17	5·59	5·43
5	5·0	6·46	5·24	6·40	5·43	6·16	6·0	5·42
6	5·1	6·46	5·25	6·39	5·44	6·15	6·0	5·41
7	5·2	6·47	5·26	6·38	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·1	5·39
9	5·3	6·47	5·27	6·37	5·46	6·12	6·2	5·38
10	5·4	6·47	5·28	6·36	5·46	6·10	6·2	5·37
11	5·5	6·47	5·29	6·36	5·47	6·9	6·3	5·35
12	5·5	6·47	5·30	6·35	5·47	6·8	6·3	5·34
13	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
14	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
15	5·8	6·47	5·32	6·33	5·49	6·5	6·5	5·31
16	5·9	6·47	5·32	6·32	5·49	6·4	6·5	5·30
17	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·50	6·2	6·6	5·29
19	5·11	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·12	6·46	5·35	6·29	5·51	6·0	6·7	5·27
21	5·12	6·46	5·36	6·28	5·52	5·59	6·8	5·26
22	5·13	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·14	6·45	5·37	6·26	5·53	5·57	6·9	5·24
24	5·15	6·45	5·38	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5 54	5·55	6·10	5·22
26	5·16	6·44	5·39	6·23	5·54	5·53	6·10	5·21
27	5·17	6·44	5·40	6·22	5·55	5·52	6·11	5·20
28	5·18	6·44	5·40	6·21	5·55	5·51	6·11	5·20
29	5·19	6·43	...	...	5·56	5·50	6·12	5·19
30	5·20	6·43	...	...	5·56	5·49	6·12	5·18
31	5·21	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

		H. M.
9 Jan.	● New Moon	3 27 p.m.
17 „	☾ First Quarter	4 31 p.m.
24 „	○ Full Moon	9 8 a.m.
31 „	☽ Last Quarter	6 2 a.m.

Apogee on 9th. Perigee on 23rd.

---

8 Feb.	● New Moon	10 37 p.m.
16 „	☾ First Quarter	4 53 a.m.
22 „	○ Full Moon	7 33 p.m.

Apogee on 5th. Perigee on 21st.

---

1 Mar.	☽ Last Quarter	abt. m'night
10 „	● New Moon	4 9 a.m.
17 „	☾ First Quarter	1 49 p.m.
24 „	○ Full Moon	6 19 a.m.
31 „	☽ Last Quarter	7 13 p.m.

Apogee on 5th. Perigee 21st.

---

8 Apr.	● New Moon	7 5 p.m.
15 „	☾ First Quarter	8 12 p.m.
22 „	○ Full Moon	5 50 p.m.
30 „	☽ Last Quarter	2 9 p.m.

Apogee on 2nd and 30th. Perigee on 17th at 3 p.m.

ECLIPSES.

An Annular Eclipse of the Sun visible in North of Scotland but not in Australia will occur on April 8th.

An Eclipse of the Moon will occur on April 22nd, when the Moon will rise totally eclipsed.

The Planets Venus, Mars, and Uranus will be remarkably close together apparently on January 9th, and will form a fine celestial picture with the Moon on the 13th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S. —add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

cop. 2

Queensland.

Department of Agriculture and Stock.

Volume XV. no. 5 MAY, 1921.

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THE

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ISSUED BY DIRECTION OF

THE HON. THE SECRETARY FOR AGRICULTURE.

EDITED BY A. J. BOYD F.R.G.S.Q.

VOL. XV. PART 5.

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QUEENSLAND AGRICULTURAL JOURNAL

Vol. XV. MAY, 1921. Part 5.

Agriculture.

IMPROVING THE TYPE OF COTTON.

By A. J. BOYD, late Editor, "Queensland Agricultural Journal."

The revival of late of the cotton-growing industry, once so thriving in this State owing to the scarcity of American cotton during the Civil War in the United States, gives rise to the question, "Does the continuous sowing of locally produced seed in any way affect the quality and quantity of the resulting crop?"

There are several products of the soil which imperatively demand that seed should be obtained from other districts if the standard of the original crop is to be maintained. The day when growers can afford to plant any sort of cotton seed has passed, and only seed of a known variety, selected either within the State or from other reliable sources, as, for instance, Egypt, or from such of the Southern States of the United States as are not infested by such pests as the boll worm, boll weevil, and cotton stainer, &c., should be planted.

It is a well-known fact that varieties of cotton become mixed and impure unless special care is taken to prevent crossing with other varieties. With all the care exercised by the Department of Agriculture to avoid the mixture of long and short staple cotton by close examination prior to ginning, it is practically impossible to avoid the admixture of different varieties, which seriously affects the price of the commodity, especially when exported to Great Britain.

If growers receiving seed of any of the varieties sent to them desire to grow the same variety another year, precautions should be taken to plant the seed in an isolated patch as far as possible from any other varieties. It should be at least 400 yards from any other cotton. Then, before any seed is gathered for after-planting, all plants which are not true to type should be carefully weeded out.

If it is desired to keep the variety up to its full productiveness, and better adapt it to local conditions, the planter may easily accomplish this by following a simple and inexpensive method of selection. Before beginning the picking, go over the patch carefully and select and mark with a white cloth the best plants—that is, the most productive, earliest in ripening, and having the largest, best formed, and most numerous bolls. Before each picking, a careful man should go over the patch and pick the seed from the selected plants. Such seed may, with advantage, be sown the next year. If this simple method of selection is carried out each year, the yield will be, doubtless, greatly increased, and as much, or more, added to the crop than would result from special fertilisation or cultivation or importation.

Our planters use seed taken from the Department's gins, where, notwithstanding the great care taken to separate the different varieties, admixture cannot be avoided unless the growers follow out the simple instructions above given. The use of good seed and its production by a regular system of selection is just as important a factor in the production of the crop as that of cultivation.

Herbert J. Webber, Physiologist in charge of the Laboratory of Plant Breeding, United States Department of Agriculture, in 1903, said, on this subject of selection: "As well might the breeder of fast trotting horses introduce dray animals into his stable, or the breeder of intelligent hunting dogs introduce ordinary mongrel curs into his kennels."

This necessity for improving the type of our cotton has not been lost sight of by the Queensland Department of Agriculture. In furtherance of this object, a series of experiments has been decided on with the object of improving the standard and quality of commercial cotton grown in Queensland. For this purpose several seed selection plots have been established in various districts. At Beaudesert there are four of these plots, which were lately visited and reported on by Mr. C. McKeon, Assistant Instructor in Agriculture, and in his report he mentioned that the long staple upland types are looking remarkably well and giving promise of a good yield. Some splendid specimens of cotton bolls are showing up splendidly, and it is expected that, as a result of the tests, some distinctly improved types will be produced.

This undertaking, I expect, will bear out what I have written concerning the method of evolving good and improved types of Queensland cotton, and the results cannot but be highly encouraging to growers, and go a lonog way towards placing the State amongst the large cotton-producing States of the world. As one of the pioneers of cotton-growing in Queensland, I am confident that once farmers come to realise the great returns from a good cotton crop, they will not easily abandon such a valuable contributor to the credit side of their account.

THE CULTIVATION OF CHICORY.

In the days when coffee-growing bid fair to become a settled industry, a few farmers in the North planted chicory and found a good local market for the prepared product. Now that coffee-growing has again been taken up in some parts of the State, under the guidance of the oldest and most successful of our coffee planters, Mr. T. A. Bromiley, of Pialba, there must arise a demand for chicory, which is largely used for mixing with ground coffee. In view of this probability, we republish a paper we compiled on the subject in April, 1915. It deals exhaustively with the whole subject, and may prove of much use to any farmer who may plant it. It reads as follows:—

CHICORY (*Cichorium Intybus*).

Chicory—or succory, as it is sometimes called—is an herbaceous perennial plant belonging to the natural order Compositæ. Its roots are strong and fleshy, penetrating to a considerable depth in loose open soil. The lower leaves resemble those of the well-known dandelion; the upper leaves are ovate (egg-shaped). The stems are alternately branched, from 2 to 6 feet high, and they become woody after the flowering period. The flowers, of which a great many are borne, are arranged along the stems, two being usually placed close together, and are of a bright sky-blue colour, rarely white. The fruits are small, one-seeded, angular nuts.

The plant is common in many parts of England on gravelly and chalky soil, in waste places, and along road sides. It is grown in many parts of the Continent of Europe, especially where small holdings are prevalent, as a forage crop, to be cut and consumed in a green state, or used for the grazing of sheep and cattle, which are very fond of it. The young leaves are often used like spinach, and in Europe the tender young roots are used as a vegetable, like carrots. The root of the chicory plant is of the order of the beet or salsify root. As a cultivated plant it has three distinct applications. Its roots, roasted and ground, are used as a substitute for, adulterant of, or addition to coffee; both roots and leaves are employed as salads; and the plant is grown as a fodder or herbage crop, which is greedily eaten by cattle.

The largest quantities of chicory were grown in Belgium and France previous to the great war of 1914. When grown for the sake of the root, the leaves should not be cut or pastured before harvesting. It is important to note that the leaves should not be fed to milch cows as they make the milk bitter.

As a farm crop, its chief advantages are its adaptability to dry, poor soils, its power of growing several large cuts of green food per annum when once established, its perennial character and easy cultivation. It is an exceedingly hardy crop.

Soil Preparation.

Experience has shown (we learn from Messrs. Wilcox and Smith's Farmers' Cyclopædia of Agriculture) that chicory is adapted to any good loam soil that will produce good root crops, and that it will thrive wherever the sugar beet or mangolds do well.

Land for chicory should be deeply ploughed in the Spring, be well harrowed, and worked down to pulverise all lumps and make it compact, and again harrowed just before the seed is sown to kill all germinating weed seed.

Planting.

The seed may be sown at any time in fine weather in the Spring, in rows 18 to 24 inches apart if horse cultivation is intended, and from 12 to 14 inches apart if the crop is cultivated by hand. From 1 to 1½ lb. of seed is required per acre, but for use as a green crop from 10 to 12 lb. of seed are usually sown. The seed should not be covered more than three-quarters of an inch deep, and not more than one-half inch in heavy or wet soils.

Cultivation.

After the plants are up, they will need frequent shallow cultivation with some of the light cultivators made especially for sugar beet, to kill the weeds and preserve the soil moisture. When the plants have attained the height of 2 or 3 inches, they should be thinned out to stand from 4 to 6 inches apart. Only one plant should be left in a place.

Harvesting.

If chicory is grown for forage, a crop of leaves can be cut in the Autumn, and afterwards two or three crops per annum will be provided. It is best cut just when the flowering shoots are extended, and before they become woody and hard, or the field can be grazed at intervals instead. The plant usually lasts (as a forage plant) in a productive state for four or five years.

In harvesting the root crop, a beet loosener may be run along the rows. This breaks the connection of the roots with the soil so that they can easily be lifted by hand. A less convenient way is to run a plough alongside the rows so as to expose the roots on one side. Special machinery has also been devised, and is procurable in the United States or in Europe (Holland, Belgium, Switzerland before the war), for pulling the roots. After removal from the ground, the tops are cut off at the base of the bottom set of leaves. The roots should not be pulled until they are ripe, and this stage is indicated by the disappearance of the milk from the roots.

If it is desired to keep the roots some time before delivery to a factory, they may be stored out of doors in piles from 4 to 5 feet wide at the bottom, and covered lightly with straw and earth. The ridges of the piles should be left open for a few days to let the warm air escape. The yield varies from 5 to 10 tons of fresh roots per acre.

Preparation of the Roots.

For the preparation of chicory, the older, stout, white roots are selected, and, after washing, they are sliced up and dried in a kiln. In our hot summer, however, the drying can be performed by spreading the sliced roots on a canvas framework, covering them at night to protect them from dew. In two or three days they are dry enough to bag. There are several varieties of chicory, but the sorts generally used for mixing with coffee are Magdeburg, Brunswick, and Elite, the last-mentioned variety being similar to the large-rooted Brussels or "White Loof" variety. The latter has a thick stubby root, and is the most profitable to grow for manufacture.

Marketing.

The chicory grower can either sell the dried, sliced roots or he may roast them in a revolving iron cylinder. The loss in weight by this process is from 20 to 30 per cent. During the roasting 2 lb. of lard should be added to every cwt. of chicory to give it a lustre like that of coffee. The ground chicory looks like ground coffee, and smells like liquorice. There is a good market for it both in Brisbane and the Southern States, and now that the devastation caused by the war has practically put an end to the cultivation of many crops, such as beetroots, chicory, flax, and others—in Belgium and France—it would seem that there is a good opportunity for Queensland farmers to enter upon chicory cultivation and afterwards retain a business which cannot but be profitable.

Before the above calamitous war overtook France and Belgium, the price of Belgian chicory was £7 5s. per ton f.o.b. Antwerp; to-day Dutch chicory f.o.b. Dutch ports is quoted at £16 per ton for the dried roots. The wholesale price to retailers

of manufactured (*i.e.*, roasted and ground) chicory was £27 per ton, whilst now it is £45, and the price still rising. Here is a good opening for Queensland farmers to seize upon this industry and hold it for the future.

As to the prices for the dried root, Messrs. Harper and Co. are purchasers of good samples of dried and cured chicory roots at prices which should enable the grower to make a good profit on his crop. The seed may be obtained in Brisbane, and we understand that the price is 3s. per lb.

TREATMENT OF ALGAROBA SEED.

Some twenty years ago we published articles dealing with the Algaroba or Mesquit Bean as a fodder for stock. In April, 1900 and 1901, there were two articles on the value of the pods for this purpose, and full descriptions of the tree, its uses, and method of cultivation, written by Mr. G. B. Brooks, Instructor in Agriculture in the Rockhampton District, and at the time mentioned manager of the State Nursery, Kamerunga, near Cairns. *Inter alia* he wrote that, as in many localities in the Northern and Central districts stock has to depend almost entirely on the withered herbage as a means of existence, it would be a good thing of much interest to stockowners if something would come along to supply the necessary feed, something that would cost little or nothing by way of cultivation, and which could lay claim to a little attention from the large stockowner to the small selector.

In this respect he found the algaroba bean worthy of consideration, for, both from personal observation and information gathered from various sources, he found that the tree possesses qualities to draw it from its obscurity here in Queensland, and to give it a place among those plants having a high economic value.

Not only is it a tree that will thrive and flourish in circumstances such as described above, but it gives large crops of beans, valuable as stock feed, with a high fattening value, and, moreover, remains in bearing for some considerable time.

Another point in its favour is that it drops its pods as soon as ripe, thus doing away with any labour or expense in picking or feeding by hand. The tree of which Mr. Brooks wrote is the *Prosopis juliflora,* which grows to a height of from 30 to 40 ft. The pods are flat and from 5 to 8 in. long, and many bushels are obtained from a tree. It begins to ripen its pods at the end of November, and still continues bearing them after February and March. The timber is also very durable, and takes a polish like mahogany.

Some difficulty has been experienced by intending growers in raising seedlings, and disappointment has caused several to give up the idea of raising trees. However, the ''Hawaiian Forester'' (January, 1921) sets the difficulty on one side, stating that the results of a test, conducted earlier in the year, on the germination of seed of the algaroba or mesquit (*Prosopis juliflora*) when given different treatment before sowing were written up and printed in a special article which appeared in the December, 1920, ''Hawaiian Forester and Agriculturist.'' A summary of the results obtained by the test is as follows:—

1. Algaroba seed is prepared for quick germination on passing through the alimentary system of a horse only when the seed is removed from the tough parchment-like covering.

2. Naked algaroba seed, untreated in any manner, gives the best germination results.

3. Placing the naked seed in boiling water and soaking it for 24 hours does not injure the seed, but greatly hastens germination.

4. The parchment-like seed covering greatly hinders germination.

RELATION OF LIME TO SOIL FERTILITY.

The following is the summary and conclusions of experiments conducted by Messrs. J. W. Paterson, B.Sc., Ph.D., and P. Scott, Chemist for Agriculture (Victoria), regarding the Relation of Lime to Soil Fertility:—

1. Lime tends to leave the surface soil through various channels, and fresh applications become necessary to maintain fertility.

2. Carbonate of lime is the best form of lime for the soil.

3. Burnt and slaked lime are rapidly changed to carbonate when they are applied to land.

4. The rate at which lime acts depends on its fineness of division.

5. Lime, but especially hot lime, has a good effect upon the mechanical condition of stiff clays.

6. Gypsum also coagulates clay, but it has not the beneficial action of lime in other directions.

7. Lime greatly hastens the production of nitrates.

8. It has a good effect in liberating potash and phosphoric acid, especially when the latter is combined with iron or alumina.

9. Where required by soil, lime produces larger crops.

10. It produces root crops, which are of greater feeding value.

11. It may often be a profitable application to grass land.

12. Lime kills sorrel, docks, and other acid-loving weeds.

13. It is specially stimulating to lucerne, clovers, and leguminous plants.

14. Lime will not act if phosphates are deficient.

15. It increases the need, everywhere present, of ploughing in green manure or stubbles.

16. It facilitates this operation.

17. The surest method of determining the need for lime is to dress trial strips and await results.

In an article on "Lime for Orchards," Mr. P. J. Carmody, Chief Orchard Supervisor, dealing in a practical manner with the effect of lime on fruit and fruit trees, and advocating its use, writes:—

"When it is considered that the average crop of fruit requires more plant food for its development than an average crop of wheat, and, moreover, that the fruit demands the same soil constituents year after year, the necessity for a sweet and favourable medium for root pasturage is apparent; and as no other application is at all comparable to the influence of lime for this purpose, its frequent use is urgently required. It is a matter of common observation that the fruit-buds of trees grown on sour soils are of a weak or indefinite character, while the bark is harsh and dry in appearance and the growth more or less stunted. Under such conditions it is practically impossible to develop trees on the most profitable lines without first correcting soil acidity by the free use of lime in the same manner as requires to be adopted for other farm crops.

"In many parts of the State insufficient attention has been given to this feature of soil management in the orchards. Particularly is this the case where fruit is grown on heavy clay soils. In these soils fruit trees grow through a lengthy period, so that a considerable quantity of immature wood is produced to the detriment of subsequent crops of fruit. Measures have not hitherto been adopted to definitely determine the actual effect of lime on the different parts of the tree; but investigations in other countries show that on soils rich in lime the wood is matured earlier and the fruit-buds are more stocky and robust than is the case with trees grown on soils deficient in lime. This is very apparent to anyone acquainted with the fruit areas of many parts of Gippsland and other places in Southern Victoria, and one is struck with the unusual prominence or length of the fruit-buds, the relative distance between the nodes, and the softness of the wood in these districts when compared with the same varieties grown in fruit centres known to possess lime in abundance."

It may not, however, be correct to assign these differences solely to the effect of lime, as other soil constituents bear an important part on the character of the tree and its fruit buds, particularly potash. It is generally recognised that the trees are not so manageable nor so prolific in bearing in soils where lime is deficient, and growers who have rectified this have had excellent results, though as artificial fertilisers were subsequently applied the same year, the relative value of the lime could not be ascertained. Though lime plays an important part in the apple and pear tree, it is in the stone fruits that its value is most apparent. It is a familiar fact that in soils rich in lime, stone fruit set their crops well, and are not so prone to cut off their fruit at the period of "stoning" as is otherwise the case. Where trees are making extensive wood growth with abundant foliage, there is but little doubt that the application of lime at the rate of 7 to 8 cwt. to the acre would be of pronounced benefit.

Seed Wheat for Disposal.

AT HERMITAGE STATE FARM.

This Department has been experimenting for a number of years with several varieties of wheat as a result of crossbreeding and selection work at Roma State Farm; some have consistently given satisfactory results, very often under adverse conditions. These are now being offered to wheatgrowers, in order that they may have the opportunity of acquiring seed of varieties which have been tested and found suitable to soil and climatic conditions in the wheatgrowing districts of the State.

Orders for the undermentioned varieties (which are illustrated and described elsewhere) should be directed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Remittance must accompany order, and, in the case of cheques, should have exchange added.

The price quoted for any of the varieties offered is 11s. per bushel, f.o.b. Hermitage.

VARIETIES.—"Inglewood," "Patriot," "The Prince," "Gundi."
(*See* accompanying illustration of three of the varieties.)

In addition to the above a limited quantity of "Amby" is also available at the same price.

Inglewood.—Mid-season variety. This is derived from a cross between Bunge and Federation Wheat, and has given consistent results in the South-Western wheat areas. The plant is of medium height, and on strong soils is inclined to carry a fair amount of flag. It stools well and possesses a straw of medium strength. Heads are of medium length, slightly tapering; non-bearded. The chaff is smooth and light-brown in colour. Grain of medium size, somewhat elongated in appearance; semi-translucent.

Patriot.—Derived from a selection made after crossing Bunge and a Durum wheat. A mid-season variety, of moderate stooling habit. Straw is of medium height and somewhat tough. Flag scanty. Head tapering, non-bearded, open appearance, and of medium length. Chaff smooth and of a pale-golden colour. Grain somewhat short; full-bosomed; semi-translucent.

Plate 22.—Seed Wheat for Disposal.

The Prince.—A selected crossbred wheat; early mid-season variety, of fairly tall-growing habit, suitable for main-crop sowing. A good stooler, and carries very little flag. Head of medium length, open appearance, slightly tapering; non-bearded. Chaff smooth and of a pale-golden colour and somewhat closely attached to the grain, which is plump, full-bosomed, semi-translucent, and of medium hardness. Fairly resistant to rust.

Gundi.—A selection from a Bunge-Federation cross. A mid-season variety suitable for early sowing, of moderate stooling habit. It carries a medium amount of flag. Straw moderately stout and slightly under medium height. Head long and compact. Chaff smooth and light-brown in colour. Grain medium-sized; somewhat rough skinned; white in colour. This variety has given a yield of 37.2 bushels at Roma State Farm. More suited for Western and South-Western conditions than for the Downs.

Amby.—A popular variety suitable for main-crop sowing. It is a hardy mid-season variety and a good stooler, carrying a moderate amount of flag. Ears compact, non-bearded; chaff white and smooth. Grain plump and rather shotty in appearance; semi-translucent. Is an excellent milling wheat and has given good results in the principal wheat-growing districts.

AT STATE FARM, ROMA.

The following varieties of Seed Wheat are available for distribution from Roma State Farm. Price 11s. per bushel; free on trucks, Bungeworgorai:—

"Amby." **"Bunge No. 1."** **"Soutter's Early."**

Limited quantities of the following new wheats are also available at the same price:—

"Cedric." **"Inglewood."**

In the event of farmers desiring to have small quantities not exceeding 1 bushel of new varieties of Roma Crossbreds for trial this season, arrangements for their purchase may be made with the Manager at the same rate—*i.e.,* 11s. per bushel, free on trucks, Bungeworgorai.

Remittance, with exchange added, should accompany order, and be sent direct to the Manager, State Farm.

DIGESTIBILITY OF FODDERS.

BY J. C. BRUNNICH and V. S. RAWSON.

[Read before the Hobart-Melbourne meeting of the Australasian Association for the Advancement of Science.]

One of the branches of agricultural chemistry which requires thorough investigation at the present time, and so far has only been attacked in isolated instances, is that of the nutrition of our farm animals. It is our desire in this paper to discuss briefly digestibility tests of certain foods used on the farm, but at the outset it should be mentioned that a short experiment carried out on one sample of each fodder can only act as a general guide, and it would be unwise to accept such figures as are given as a fixed basis without several further experiments being carried out on each special foodstuff.

We believe that the only instance of previous digestibility experiments which have been carried out in Australia were conducted by Professor Perkins on horses some years ago, and so far as we know our experiments are the first which have been carried out with sheep, which, it may be mentioned, have practically the same power of digestion as cattle. When it is considered that similar trials have been made in Germany for the last sixty years and in America since 1884, while now thousands of experiments have been conducted, thus giving reliable data for determining the digestibility of the various fodders used there, it cannot but be felt that we are much behind the times. In England, also, use has to be made of German and American figures, though within the last few years the Institute for Research in Animal Nutrition at Cambridge University has been conducting experiments on these lines under Professor T. B. Wood, F.R.S., and also at the Leeds University under Dr. Crowther similar experiments have been made. Quoting from the former in "Science and the Nation," these words may be said to apply even more to Australia, where the conditions of climate, soil, and growth are so different:—"But in our knowledge there are many gaps, some of which the staff of the Institute were attempting to fill when war interrupted their work. Perhaps the most serious need at the present time is further information as to the composition and digestibility of British fodders. This need is most felt in the case of coarse fodders, such as hay and straw, whose composition and digestibility vary greatly according to variety, cultivation, and harvesting. It is obviously most unsatisfactory that farmers should have to rely on German figures for information as to such material."

It will be of interest before discussing the results of our experiments to give a brief outline of the work which has been carried out in Germany. One of the writers visited Göttingen in 1906, where extensive work is carried out on the nutrition of farm animals under the direction of Professor Lehmann, and is a continuation of the famous Weende Experimental Station, where Henneberg and Stohmann carried out so much of the foundation work. In the Agricultural Institute of the University a large number of feeding experiments are carried out both as regards the digestibility and metabolism of fodders. The latter requires a special apparatus known as a respiration chamber, of which there are several in America and Germany, the general outline of which is as follows:—The animal is kept in a cubic iron box about 8 ft. each way, the plates of which are riveted together and are perfectly air tight. The air entering the chamber is freed from carbon dioxide and the amount carefully registered. The air, on leaving the chamber, passes over calcium chloride to absorb water; then caustic potash, which absorbs the carbon dioxide; then over copper oxide, to oxidise the methane to carbon dioxide, which is again collected as before. Thus the amount of gases given off by the animal can be calculated and at the same time, by collecting the fæces and urine, the complete fate of the food can be accounted for.

An actual experiment carried out was as follows:—

NITROGEN BALANCE SHEET.

SUPPLY.	
N. in food	1.00 gram
EXCRETED.	
N. in urine	0.52 grams
N. in fæces	0.42 grams
Balance	0.06 grams

0.06 gram N. retained by animal equivalent to 0.375 grams of protein.

CARBON BALANCE SHEET.

SUPPLY.

Carbon in food	30.0 grams

EXCRETED.

Carbon in urine	2.6 grams
Carbon in fæces	8.3 grams
Breathed out as CO_2	6.4 grams
Breathed out as CH_4	0.2 grams
Remaining in body	12.5 grams
Carbon in 0.375 grams protein	0.198 grams Carbon
Leaving for fat production	12.302 grams Carbon

Equivalent to 16 grams fat.

The most intricate of these chambers is at Bonn, where Professor Hagemann has his animal physiology laboratory. This apparatus measures the quantity of heat radiated from the animal by its absorption in a known volume of water surrounding the chamber and is known as the Atwater Rosa calorimeter. This piece of machinery alone cost £10,000 to bring into complete operation. Mention must also be made of the station at Möckern, where Director Kellner has carried out such classical experiments as are to be found in English in his small book, "The Scientific Feeding of Animals." The appendices of this useful book contain the analyses of about 400 fodders and a large number of digestible co-efficients of the various farm foods.

Though naturally one cannot expect experiments to be carried out in Australia on so large a scale, it is surprising that so little work has been done or so little thought given to the digestibility of Australian fodders. It is hoped that the experiments which are mentioned in this paper will stimulate interest in this connection, though they can only be regarded as an introduction to further investigation of this nature. These experiments were carried out at Yeerongpilly Experimental Station with the permission of the Under Secretary for Agriculture and Stock, where stalls were erected for four wethers of the merino cross variety, and in all the digestibility of nine different foodstuffs was determined, each test being made in duplicate.

FOODSTUFFS TESTED.

Poor bush hay	Lucerne	Wheat pollard
Wheat bran	Maize	Mitchell grass
Maize and millet ensilage	Coarse blood meal	Fine blood meal

So far as could be arranged, the sheep were fed on a maintenance ration throughout the experiment, and there was little variation in their live weight during the whole of the experiments, which lasted for four months. The rations were as follows:—

1. Lucerne.
2. Lucerne; bush hay.
3. Lucerne; bush hay; pollard.
4. Lucerne; bush hay; bran.
5. Lucerne; bush hay; maize.
6. Lucerne; bush hay; maize; coarse blood.
7. Lucerne; bush hay; ensilage.
8. Bran; bush hay; ensilage.
9. Lucerne; hay; pollard, coarse D. blood.
10. Lucerne; hay; pollard; fine D. blood.
11. Mitchell grass hay.
12. Mitchell hay; lucerne.

Each of these rations was fed for a preliminary run of a week, so as to enable the influence of the previous ration to be completely exhausted, and then the fæces were collected each day for twelve days in specially made bags, fitting closely over the hind quarters of the animals. The amount of food was weighed daily, and also

the fæces, one-fifth of the latter being taken and dried, and at the end of the period ground fine, sampled, and analysed. Knowing the amount of nutrients in the fodder fed, from an analysis, and also that in the fæces, one can estimate the amount which the animal digested. It is not considered necessary here, nor will space permit, to give a detailed outline of each experiment, which involved a very large amount of work and calculation, but mention should be made and comparisons given of data from American and German sources. The former are to be found in "Feeds and Feeding," by Henry and Morrison; the latter in the forementioned book "The Scientific Feeding of Animals."

It is also necessary to mention a few terms which will be used in determining the value of the different fodders which are based on the Kellner's standards:—

Starch Equivalent.—The starch equivalent is a convenient method of estimating the protein, fat, carbohydrates, and fibre under one standard, though there is much controversy whether another term should not be applied. Murray, of Reading, and Armsby, of Pennsylvania, are both in favour of using the term "net energy value," and though when properly understood both terms express the extent to which the feed is able either to diminish or prevent loss of stored energy from the body, or to bring about a storage of energy in new tissue. It should definitely be decided which term to apply; otherwise there is bound to be always a certain amount of confusion. The *starch value,* as here given, is the amount of starch that is equivalent to the fat-forming power of all the nutrients in the food. It may be noted—

	Starch.
1 lb. of digestible fat in oil seeds, cakes, and meals	2.41 lb.
1 lb. of digestible fat in cereals	2.12 lb.
1 lb. of digestible fat in coarse fodders	1.91 lb.
1 lb. of digestible carbohydrate and fibre	1.00 lb.
1 lb. of protein	0.94 lb.

The starch equivalent of a food is therefore determined by multiplying the percentage of digestible nutrients by these factors respectively, and, after addition, deducting the amount of energy which the animal uses up in masticating and digesting the food, which is the percentage difference of the static and dynamic value of the food. In the case of coarse fodder (hay and straw) it is advisable to deduct a certain percentage of the total crude fibre in the fodder, varying with the amount contained therein, whereas in concentrated fodders a factor is used for each food known as the "value number." The following table shows the fate of the food:—

Food supplied.

Digested. — Not digested (in fæces).

Assimilated. — Not assimilated (in fæces).

Required for mastication and digestion. — Available for body.

Required for working heart, lungs, &c. Maintenance. — Available for laying on flesh, doing work, milk production, &c.

It should be clearly understood that the amount digested is not strictly given by the "digestible co-efficient," as in the process of digestion certain nitrogenous waste products are given off with the fæces from the alimentary canal, such as bile compounds, mucus, and epithelials cells, also certain nitrogenous compounds as skotol and indol, which are the product of fermentations. The bile also contains a small percentage of fat which makes the digestible fat lower than it really is. These products vary to a certain degree, and naturally with a small percentage of total protein and fat the error is increased. The results obtained, however, are close enough to be of real value to judge the processes going on in digestion of the food tested. The chemical methods which have been instigated for the separation of digestible and indigestible constituents have only proved of value in the case of crude protein, by artificial digestion with pepsin and hydrochloric acid. At the same time it must be remembered that the process of natural digestion shows how much the animal takes up, including the loss of other material from the body, and thus gives the real increase. The term "apparent digestibility" is used at times.

The first experiment had to be conducted on a single food in order to obtain the necessary data on which to base the subsequent calculations. It was hoped to feed the sheep on bush hay alone, as well as lucerne, but they refused to eat it alone, and hence the data are based on a very closely agreement duplicate of the lucerne hay digestibility.

ANALYSIS OF LUCERNE.

——	Organic Matter.	Crude Protein.	Crude Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	80·96	15·95	1·40	38·21	25·40	12·36	..
Percentage digestible	58·00	12·82	·66	28·01	16·51	9·23	39·73
Digestible co-efficient	71·50	80·40	47·1	73·3	65·0	74·70	..
AFTER KELLNER (ANALYSIS OF LUCERNE OF SAME MOISTURE).							
Analysis	82·09	17·33	2·57	33·30	28·89	12·95	..
Percentage digestible	46·78	13·52	1·13	22·31	9·82	9·14	28·12
Digestible co-efficient	57·0	78·0	44·0	67·0	34·0	70·7	..

It will be seen from these figures that though the analysis of the German lucerne gives practically the same figures as our own, yet on examination we find that the organic matter, and especially the fibre, is much more digestible, and hence the true starch equivalent of the lucerne as analysed by Kellner is much lower than the one tested here.

POOR BUSH HAY.

——	Organic Matter.	Crude Protein.	Fat.	N.F.E.	Fibre.	Fine Protein.	Starch Equivalent.
Analysis hay	78·21	2·95	0·77	39·94	34·55	2·63	..
Percentage digestible	45·53	0·45	0·25	21·13	21·70	0·14	23·42
Digestible co-efficient	55·3	15·50	33·5	52·9	62·8	5·90	..

It is impossible to make comparisons of this hay with any from America or Germany, but there are two outstanding features to be noticed:—Firstly, the digestibility of the protein is very much lower than any figures from these countries, as the amount of true digestible protein is practically negligible, whilst on the other hand the digestibility of the crude fibre is considerably higher than the average generally given for poor pasture. These two features emphasize the statement previously referred to by T. B. Wood that the determination of the digestibility of hay and straw is most essential.

POLLARD.

——	Organic Matter.	Crude. Protein.	Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	86·4	14·70	4·26	62·13	5·31	13·11	..
Digestible	66·73	11·60	3·15	49·83	2·15	10·0	68·12
Digestible co-efficient	77·30	78·90	74·1	80·2	40·5	76·90	..
AFTER HENRY.							
Analysis	85·10	17·40	4·9	56·8	6·00	..	..
Digestible	63·8	13·40	4·3	44·3	1·80	..	..
Digestible co-efficient	75·0	77·0	88·0	78·0	30·0	..	..

Compared with the analysis by Henry there is not much difference, only it will be noticed that the digestibility of the fat is much lower, whilst again we notice an increase in the digestibility of the fibre.

(TO BE CONTINUED.)

PISÉ BUILDINGS FOR FARMERS.

The increasing cost of building timber in Queensland is causing new settlers to seek information concerning the cost and method of erecting what are known as pisé houses, the material for which is the soil itself. The most informative article on this style of building we have as yet read appeared in the "Agricultural Gazette of New South Wales" in May, 1907. The whole process of building is therein described, and several illustrations show the process from the foundation to the top of the walls. We have seen these buildings 50 years old in Peru, South America. In January, 1917, we briefly described the method as follows:—

"Having taken up a selection either for farming or grazing, the settler in the old days of the 'colony' of Queensland, forty or fifty years ago, either rigged up a tent for his first home, or, if in a locality where there was plenty of splitting timber or tea-tree, he rose to the dignity of a humpy of low log walls roofed with tea-tree bark, or stripped some sheets of stringy bark and built a bark hut; later on, perhaps, he split slabs and shingles, and dwelt in a fairly comfortable house. In the primeval scrub or forest, this question of housing himself, and perhaps his family, was easily solved. But it was otherwise when the farm happened to be situated on the plains. Then it meant either continuous tent life, or, as the alternative, a galvanised iron or a sawn timber structure, both very expensive in the pre-railway days. Yet, all the time on the treeless plain, all the materials were at hand for the construction of a comfortable weather-proof house, warm in winter, cool in summer, which could be erected by the farmer himself, the only tools needed being a pick, shovel, and rammer, and half a dozen planks.

"The material for the construction of the walls, chimney, and flooring was the soil itself. All that the settler need do is to dig out the soil and shovel it into rough wooden moulds, ramming it down solid in layers of 4 or 6 in. When the mould or box is full and well rammed, it is taken to pieces and erected on another portion of the building, and the work proceeds until the walls and partitions are completed. Any inexperienced man can thus construct a comfortable dwelling, as the actual pisé work presents so little difficulty that it can be done by anyone who has sufficient strength to shovel earth and wield a rammer, and is careful to see that the moulds or boxes into which the soil is shovelled are kept plumb and in straight lines. The services of a carpenter, unless the settler has some knowledge of that trade, will be found necessary to make doors and window-frames and construct the roof, and see that these are set correctly and in their proper places.

"The whole process is well described in the 'Agricultural Gazette of New South Wales' by Mr. G. L. Sutton, Cowra Experimental Farm, 2nd May, 1907.

"In some of the South American States there are numbers of such buildings constructed either of rammed soil or of adobé or sun-dried bricks (for which material like clay can be used, which is unsuitable for pisé work). For the latter, almost any soil containing a fair amount of loam is suitable; but a pipeclay loam, with which gravel is intermixed, is best. Soil which cakes after a heavy rain, or which, if ploughed or dug when dry, turns up in hard clods, is very suitable. Any vegetation growing on the surface of the earth selected must be removed, as also should any roots, bits of stick, or vegetable matter likely to decay. The earth is best used as it is dug, and, if too dry, should be brought to the correct moist condition by watering it about two days before it is to be used. The earth should be just moist enough to be crumbly, and yet adhesive enough to retain the impression of the fingers when pressed in the hand.

"We have culled the above preliminary notes on pisé building from Mr. Sutton's exhaustive description in the abovenamed 'Gazette.' It is stated that pisé buildings are much cooler than buildings constructed with solid brick walls. Some idea may be formed of the durability of pisé by the fact that there is at present, at North Logan, a stable built of pisé which has been in constant use for over sixty years, and which is to-day in good order, notwithstanding the fact that the external walls are unprotected from the weather. Pisé buildings are said to have a life of 150 years.

"It is, however, advisable to protect the walls from moisture, especially from rain, which should be guarded against by surrounding the building with verandas or by overhanging eaves. Pisé buildings not so protected are, however, very common."

TOBACCO-GROWING AT BOWEN.

In our April issue it was stated that the tobacco industry at Bowen was mostly in the hands of Chinese. This is obviously a mistake, as it is at Texas and Inglewood that the Chinese tobacco farmer is mostly in evidence, whereas at Bowen the cultivation of this crop is carried on by white farmers.

Pastoral.

USING RAM LAMBS.

On this subject the Brisbane "United Graziers' Journal" (31st March) writes:—

"When ram lambs are put to a large number of ewes their powers of procreation decline, and they are of little service the following and subsequent years. Notwithstanding the necessity of early returns in these times, says an English authority, the system occasionally advocated of tupping ewe lambs cannot be recommended. Every practical flock master knows that this practice means an arrestment of growth in the sheep and a large percentage of mortality during the lambing season. This is a very serious matter, because stock ewes are usually kept for three or four years, and when they are disposed of at draft sales they, as a rule, realise very unremunerative prices by reason of their stunted growth. It is a mistake to suppose that they will overcome the check which immature maternity has given them, because it occurs just at the time when sheep really put on most of their growth and they will never reach the same standard of size and vigour as sheep that are put to the ram the first time as shearlings."

BLOW-FLY DEMONSTRATION.

The demonstration in connection with the blow-fly pest which was in our April issue announced to take place at Dalmally, near Roma, during the second week in April, has been postponed until 13th May. In addition to a large number of Queensland pastoralists, it is expected that there will be others from New South Wales and Victoria. Dr. Harvey Johnston will be in charge of the demonstration, and will deliver an address on the subject.

THE SUGAR SEASON.

CRUSHING DATES.

The "Queensland Sugar Journal," 8th April, publishes the following information concerning the probable dates when the sugar mills will commence crushing:—

Alberton Sugar Mill, *viâ* Yatala.—Towards end of August.

Australian Sugar Company, Limited, Mourilyan Mill, Mourilyan.—First week in June.

Babinda Central Sugar Mill, Babinda.—Somewhere about the third or fourth week in May.

Cattle Creek Sugar Company, Finch Hatton, Mackay.—About middle of July.

Childers Mill, Childers.—22nd June.

Doolbi Mill, Isis.—Probably be some time in August.

Eagleby Mill, *viâ* Beenleigh.—First week in September.

Fairymead Sugar Company, Limited, Bundaberg.—Towards end of July.

Farleigh Estate Sugar Company, Mackay.—About middle of July.

Gibson and Howes, Limited, Bingera Plantation.—Early in July.

Goondi Mill, Innisfail.—1st June.

Hambledon Mill, *viâ* Cairns.—1st June.

Homebush Mill, Mackay.—1st June.

Inkerman Mill, Ayr.—About 1st July.

Macknade Mill, *via* Halifax.—1st June.

Marian Central Mill Company, Mackay.—About middle of July.

Maryborough Sugar Factory.—Every likelihood of first week of August.

Mulgrave Central Mill Company, Limited, Gordonvale.—1st June.

North Eton Central Mill, North Eton, Mackay.—About the beginning or middle of July.

Pioneer Mill, Ayr.—About 1st July.

Pleystowe Central Mill Company, Mackay.—About mid-July.

South Johnstone Central Sugar Mill, Basilisk, *viâ* Innisfail.—26th May.

Victoria Mill, Ingham.—1st June.

W. Heck, Pimpama Island.—First week in August.

Dairying.

DAIRYING AT ROMA.

The dairying industry is thriving in the Roma district, and has developed out of all proportion to the number of years it has been established. Suppliers from July to March have been paid £50,000. This is more than the amount paid for any two previous years. For the past eight months the cream supplied to the local factory amounted, in one case alone, to £1,000, and many other farmers have received £500.—Exchange.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MARCH, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Mar.	Average Rainfall. No. of Years' Records.	Total Rainfall. Mar., 1921.	Total Rainfall. Mar., 1920.
North Coast.	In.		In.	In.
Atherton	8·26	20	26·25	1·02
Cairns	17·86	39	32·21	6·96
Cardwell	16·37	49	18·38	5·68
Cooktown	14·75	45	25·48	3·52
Herberton	8·03	34	21·13	1·86
Ingham	16·28	29	15·26	8·09
Innisfail	25·20	40	62·62	8·01
Mossman	18·13	13	32·78	9·07
Townsville	7·99	50	2·93	1·86
Central Coast.				
Ayr	7·40	34	6·48	1·55
Bowen	5·87	50	11·71	0·61
Charters Towers ...	3·60	39	5·44	1·17
Mackay	12·30	50	28·58	2·45
Proserpine	11·94	18	26·87	5·75
St. Lawrence ...	6·10	50	4·50	0·25
South Coast.				
Biggenden	4·33	22	4·08	1·55
Bundaberg	5·61	38	3·31	1·72
Brisbane	5·89	70	7·86	1·80
Childers	5·22	26	4·45	2·18
Crohamhurst ...	12·30	25	14·04	4·15
Esk	4·92	34	5·44	2·31
Gayndah	3·29	50	4·29	2·32
Gympie	6·33	51	6·73	2·31
Glasshouse M'tains	9·43	13	14·60	2·52
Kilkivan	4·07	42	4·70	0·52
Maryborough ...	6·44	50	5·10	2·24

Divisions and Stations.	Average Rainfall. Mar.	Average Rainfall. No. of Years' Records.	Total Rainfall. Mar., 1921.	Total Rainfall. Mar., 1920.
South Coast—continued:	In.		In.	In.
Nambour	9·70	25	13·70	6·10
Nanango	3·37	39	6·28	1·28
Rockhampton ...	5·10	34	3·84	1·61
Woodford	8·20	34	12·16	1·85
Darling Downs.				
Dalby	2·80	51	1·18	0·62
Emu Vale	2·77	25	0·61	1·90
Jimbour	2·67	33	2·15	0·74
Miles	2·80	36	2·10	0·45
Stanthorpe ...	2·82	48	1·77	2·03
Toowoomba ...	3·93	49	5·15	1·25
Warwick	2·92	34	0·82	1·49
Maranoa.				
Roma	2·85	47	3·01	0·29
State Farms, &c.				
Bungeworgorai ...	1·67	7	2·78	0·59
Gatton College ...	3·55	22	3·64	1·88
Gindie	2·98	22	1·06	2·06
Hermitage ...	2·77	15	6·29	1·34
Kairi	4·68	7	31·17	1·58
Sugar Experiment Station, Mackay	11·33	24	26·31	2·04
Warren	3·08	7	2·11	5·95

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for March, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MARCH, 1921.

The seventeenth egg-laying competition at Gatton terminated on 31st March. Heavy moults were prevalent from the 10th of the month, due to a sudden change in weather, a week of continuous rain following after a term of hot weather. The birds returned bear sealed rings with numbers of eggs laid, of 2 oz. or more, for 360 days. The following identification rings were attached to all birds competing in the single tests:—A., green; B., red; C., yellow; D., blue; E., grey; F., white. There were two deaths during the month, viz.: Messrs. C. M. Pickering and G Flugge each lost a bird, the cause of death being paralysis in both cases. The following are the individual records:—

Competitors.	Breed.	March.	Total.
	LIGHT BREEDS.		
*G. Trapp	White Leghorns	99	1,517
*J. M. Manson	Do.	126	1,489
*Haden Poultry Farm	Do.	97	1,469
*O. W. J. Whitman	Do.	71	1,459
Mrs. R. Hodge	Do.	108	1,431
*J. Newton	Do.	75	1,427
*Quinn's Post Poultry Farm	Do.	75	1,412
*L. G. Innes	Do.	74	1,406
Geo. Lawson	Do.	85	1,404
*E. A. Smith	Do.	94	1,395
*W. and G. W. Hindes	Do.	124	1,392
*Dr. E. C. Jennings	Do.	65	1,384
*N. A. Singer	Do.	69	1,383
*J. J. Davies	Do.	63	1,382
*T. Fanning	Do.	83	1,379
*W. Becker	Do.	50	1,372
*H. Fraser	Do.	88	1,341
*G. Williams	Do.	62	1,321
*J. H. Jones	Do.	60	1,319
*Mrs. L. Anderson	Do.	78	1,311
*Thos. Taylor	Do.	68	1,311
S. L. Grenier	Do.	91	1,306
*B. Chester	Do.	83	1,302
*Mrs. L. Henderson	Do.	65	1,282
Thos. Eyre	Do.	90	1,276
*S. McPherson	Do.	75	1,270
E. Chester	Do.	83	1,230
S. Chapman	Do.	103	1,221
Avondale Poultry Farm	Do.	80	1,219
R. C. J. Turner	Do.	102	1,199
*Range Poultry Farm	Do.	40	1,198
H. A. Mason	Do.	91	1,183
W. Morrissey	Do.	84	1,175
H. P. Clarke	Do.	38	1,168
C. Langbecker	Do.	72	1,167
S. W. Rooney	Do.	34	1,161
C. M. Pickering	Do.	76	1,139
W. D. Evans	Do.	104	1,125
C. H. Towers	Do.	84	1,099
C. A. Goos	Do.	42	1,081
A. J. Andersson	Do.	73	1,050
Miss E. M. Ellis	Do. ... With	drawn	583

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
	HEAVY BREEDS.		
*A. Shanks	Black Orpingtons ...	124	1,476
*R. Burns	Do.	90	1,444
*E. F. Dennis	Do.	52	1,337
*E. Morris	Do.	87	1,364
*R. Holmes	Do.	72	1,355
*J. Cornwell	Do.	106	1,333
*A. Gaydon	Do.	75	1,322
H. M. Chaille	Do.	101	1,308
*D. Fulton	Do.	70	1,307
*A. E. Walters	Do.	91	1,255
Mrs. G. H. Kettle	Do.	82	1,243
Parisian Poultry Farm	Do.	90	1,238
*W. Smith	Do.	39	1 231
J. E. Smith	Do.	78	1,207
*E. Oakes	Do.	50	1,206
G. Muir	Do.	78	1,188
*R. B. Sparrow	Do.	43	1,185
R. C. Cole	Do.	98	1,184
*T. Hindley	Do.	48	1,176
*J. E. Ferguson	Chinese Langshans ...	83	1,109
*E. Stephenson	Black Orpingtons ...	75	1,096
*Nobby Poultry Farm	Do.	66	1,042
G. Flugge	Do.	83	1,026
Total	...	5,005	84,410

* Indicates that the pen is being single tested

DETAILS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	263	256	265	235	262	236	1,517
J. M. Manson	226	258	264	260	246	235	1,489
Haden Poultry Farm	273	200	250	268	238	240	1,469
O. W. J. Whitman	243	230	270	239	206	271	1,459
J. Newton	270	239	254	174	243	247	1,427
Quinn's Post Poultry Farm ..	264	242	238	196	223	249	1,412
L. G. Innes	174	231	233	265	269	234	1,406
E. A. Smith	228	198	259	229	240	241	1,395
W. and G. W. Hindes	220	242	209	249	239	233	1,392
Dr. E. C. Jennings	165	279	201	215	249	275	1,384
N. A. Singer	251	191	234	285	222	200	1,383
J. J. Davies	258	234	233	197	250	210	1,382
T. Fanning	139	233	224	253	272	258	1,379
W. Becker	244	243	243	227	193	222	1,372
H. Fraser	156	236	240	247	242	220	1,341
G. Williams	198	235	233	218	252	185	1,321
J. H. Jones	218	224	235	242	212	188	1,319
Mrs. L. Anderson	263	247	236	190	169	206	1,311
Thos. Taylor	255	215	195	234	221	191	1,311
B. Chester	237	190	246	200	227	202	1,302
Mrs. Henderson	202	223	221	192	226	218	1,282
S. McPherson	261	265	91	138	269	246	1,270
Range Poultry Farm	147	188	221	235	180	227	1,198
S. W. Rooney	168	186	226	174	195	212	1,161

RESULTS OF SINGLE PEN TESTS—*continued.*

—	A.	B.	C.	D.	E.	F.	Total.
			HEAVY BREEDS.				
A. Shanks	215	266	235	296	202	262	1,476
R. Burns	244	224	277	215	247	237	1,444
E. F. Dennis	260	216	194	268	216	233	1,377
E. Morris	237	230	227	197	246	227	1,364
R. Holmes	216	225	211	222	258	223	1,355
J. Cornwell	215	247	238	157	219	257	1,333
A. Gaydon	195	282	206	194	184	261	1,322
D. Fulton	228	232	209	254	92	292	1,307
A. E. Walters	199	209	194	228	184	241	1,255
W. Smith	110	246	236	235	219	195	1,231
E. Oakes	180	243	178	103	241	260	1,206
R. B. Sparrow	217	140	216	187	176	249	1,185
T. Hindley	207	248	205	174	161	181	1,176
J. E. Ferguson	151	188	141	192	234	203	1,109
E. Stephenson	213	175	209	188	166	145	1,096
Nobby Poultry Farm	199	281	86	279	177	20	1,042

CUTHBERT POTTS,
Principal.

AERIAL FOREST RECONNAISSANCE.

In an interesting article on the Survey of Forests from the air, by J. M. Swaine, Chief, Division of Forest Insects, which appeared in the January-February number of the "Agricultural Gazette" of Canada, an account is given of an experiment in aerial forest reconnaissance which was conducted last summer over the country north and west of Lake Timiskaming in Northern Ontario. The results of this experiment were very satisfactory, not only as regards the mapping out the main timber types such as conifers, hardwoods and mixed forests, recent burns and clearings in approximately 1,800 square miles of the regions surveyed from an altitude of 3,500 feet, whence it was possible to distinguish the more conspicuous species of trees and to secure a comprehensive knowledge of the forest conditions on a large area in a very short time, but, furthermore, with respect to the study by officers of the Division of Forest Insects of the Entomological Branch, of an extensive spruce bud worm outbreak spreading through the northern pulp-wood forests from Northern Quebec across the interprovincial boundary into Ontario. A strip of country, more than 100 miles long and 25 miles wide had been freshly infested during the last two summers, and the injury was spreading westward.

It was very important to determine the area covered by the outbreak last summer, and to obtain definite data upon the rate and direction in which the injury was spreading. A ground party attempted to obtain this information, but it was impossible to cover the whole area in that manner before winter, and to obtain it by a ground survey it would have taken two men at least eight months, whilst by the use of a Curtiss flying boat only three weeks were spent in the aerial survey. Much of the Temagami country carries strips of hardwoods with pine along the water-courses, and since the latter offers the only available route for a rapid survey, it is evident that a ground party must have difficulty even in locating the spruce and balsam stands. To this is added the drawback that the party cannot foretell how far or in which direction it must travel to reach the boundaries of these or of the infestation.

The possibilities of an aerial survey appealed strongly to the chiefs of the Forest Division, and the results were even beyond their expectations. The Air Board furnished a Curtiss flying boat, type F3, with a wing spread of 78 ft., and equipped with a 360 h.p. Liberty engine, which carried two observers and a pilot and three passengers. The trip from Ottawa to Haileybury, covering 336 miles, was made in five hours flying time.

There are still vast forests in Queensland and the Northern Territory which could easily be reached and mapped out in a similar manner if only the aeroplane were made available.

The Orchard.

THE CAPRIFICATION OF FIGS.

During the months of February and March last, a fair quantity of figs was placed on the market, and met with a ready sale at good prices. The fruit, however, was not notable for size, being much smaller than the Smyrna. We have not yet heard of any grower who is acquainted with the methods of cultivation and treatment of this fruit as carried out at Smyrna, where the two best varieties of figs are grown. Smyrna is a district and city of the Province of Aidan, in Asia Minor, south of Constantinople, and situated on the Mediterranean Sea, in about the same latitude as Sydney, New South Wales. There are two varieties of the famous Smyrna fig known in the trade as ''Sari lop'' (the dried fig) and the ''Bardajik,'' usually eaten in a fresh state. The peculiarity of these figs is, that their skins under favourable conditions, dry tender, which is not the case with other varieties, and, as a dried fig cannot be peeled, its skin influences its quality and value considerably.

The ''Sari lop'' is a large fig, hence the great demand for it in foreign markets, but the ''Bardajik,'' though smaller, makes a sweeter and finer flavoured dried fig. This latter is called ''Sheker Injir'' (sweet fig) in its dried state.

The fig grows very easily from cuttings, grafting, or seed. Preference is given here to cuttings, which are planted out where they are to grow into trees. The cuttings strike root very easily. The custom is to put the cuttings in the ground at an angle of about 45 in., buried right up to the top with only the leaf bud appearing above the soil; and, for protection in frosty weather, the bud also is covered temporarily with an inch or two of soil. Cuttings bear fruit in three or four years. Off-shoots or suckers are sometimes used; these are cut off the parent tree with a few small roots attached.

For the fig to reach full-sized maturity caprification must be resorted to, which is carried out by a very small fly.

This fly coming from the edible fig deposits its eggs in the seed of the fruit of the wild fig-tree, which bears an autumn fig called ''Bogha,'' and passes thence to a fig appearing in the spring on the same tree called the ''ilex,'' commonly and erroneously known as the ''male'' fig.

The edible fig-tree bears fruit later than the second crop of the wild fig-tree, and the fly passes on to that in turn and then back to the ''Bogha'' fig.

In order to control the caprification, it is found desirable that the wild tree should be planted apart from the edible fig-tree. Over caprification is apt to spoil the fig, which drops off prematurely as a result.

This fly is considered esesntial to the successful growing of the Smyrna fig, but so far it has not been exactly decided whether for cross fertilisation from the wild fig or merely from one fig to the other of the same variety.

Five to twenty ''ilex'' figs are hung in strings when ripe on each edible tree, according to size, and there left until the fig season is over.

The wild fig-tree is more subject to frost. Though leafless during the winter, the ''Bogha'' fig, then on the tree, continues growing, and it is supposed that the necessary movement of the sap renders the tree more tender than the others of the genus which are then in a dormant state.

All the Smyrna varieties grow anywhere in this district within a certain distance from the sea (about 100 miles) and prefer calcareous soil, but all figs become sweeter growing on hillsides with a southerly aspect. Too much moisture spoils the quality of the fig, though the crop may be greater and the size of the fruit larger. Young trees always produce the finest fruit.

When the fig, either the ''Sari lop'' or ''Barkajik,'' reaches maturity it requires dry weather to make it white and mellow. At this season, August and September, the prevalent winds are from the north and east, and, being dry, they are well adapted to the requirements of the fig.

The dried fig is a product of the Meander Valley, where the climatic conditions allow it to dry properly. This is attributed to the conformation of the valley, which is protected by hills from the sea breezes. The soil, which also plays so important a part in the cultivation of the fig, is calcareous here; there are also iron mines in the neighbouring hills, and it is claimed by one authority that ferruginous detritus helps to make this district the garden of the fig. The best districts in the Meander Valley are Inovassi (between Karabounar and Baladjik) and Ortaxe. The lastnamed district produces a fig superior in size, richness of pulp, and thinness of skin. In Strabo's time the figs of Antioch, which town possessed a large tract of country on both sides of the Meander, were noted as the dry figs of Antioch, and the tree on which this variety grows is called "Trephyllus."

Ortaxe is close to Antioch.

All attempts to produce it successfully elsewhere than in the Meander Valley having failed, the dry fig has come to be looked upon as a peculiarity of this district. Valleys in the neighbourhood apparently identical have been tried without success.

The fig is allowed to remain on the tree until it begins to drop off, when the crop is gathered by hand or knocked off by sticks. The partially dried fruit is spread on mats to dry in the sun for three or four days, and is then sent to market.

The operator, in "working" the figs for packing, dips his fingers into brine to prevent them from becoming sticky. The salt, besides destroying the worm to which the dried fig is subject and acting as a preservative, is supposed to help in the sugaring process. Some recommend immersion in boiling brine as a means of sterilisation. The figs are put in baskets or perforated metal drums and immersed about five minutes in the boiling brine. It is contended, however, by others that this process alters the taste of the fig and spoils those of the finer quality.

The figs when ready are shipped in small boxes or bags.

For home consumption dried figs are sometimes baked to a light-brown colour; baking gives them a pleasant flavour. Sometimes the figs are stuffed with walnuts or other nuts and spice, then sprinkled with sesame seed before baking.

No. 319 Bulletin of the College of Agriculture, Agricultural Experiment Station, Berkeley, California, has an interesting and educational article by I. J. Condit, on "Capri Figs and Caprification" (writes an Exchange).

"The capri or wild fig is the natural habitat of the fig wasp known scientifically as *Blastophaga grossorum*, which is now used extensively in California and to a lesser degree in the Commonwealth for consummating the process known as caprification of figs. A tree containing the fig wasp is growing in the Government Orchard at Hackney, and is a source of interest to some of the students who attend the practical lectures given there by Mr. George Quinn, Horticultural Instructor to the Department of Agriculture. The superior quality of dried Smyrna figs has been long recognised by connoisseurs, but the reason for their superiority was not disclosed until it was discovered that the native growers of Smyrna made a practice in the spring of the year of suspending the wild fruits of the capri fig in the Smyrna trees. From these capri figs there issued hundreds of the minute wasps already named, which entered the eye of the Smyrna fig and caused the fruit to set. Where this operation was neglected, the small Smyrna figs soon turned yellow and dropped off. On account of the very rapid growth of the fig industry in California, and the recent large plantings there of Smyrna figs, there is a keen demand, according to Mr. Condit, for practical information about varieties of capri figs, cost of caprification, and methods of distributing the figs in the orchard. It is the purpose of this publication to present the latest and most reliable information on the points mentioned, as well as on others of prime importance to the fig-grower. The bulletin is appropriately illustrated and ought to meet the needs of the fig-grower."

PROLIFIC LEMON TREES.

In a previous Journal we have drawn the attention of lemon-growers to the very successful work of Mr. H. W. Lambert at Paddington, in the suburbs of Brisbane. We have just received a branch of eleven well-grown fruits from him, which are large and very juicy. There are eleven fruits on the portion of the branch here reproduced, and they contain more juice than those of the Lisbon lemon. The tree from which this sample was taken bears a very heavy crop, and markets profitably.

PLATE 23.—A PROLIFIC LEMON.

SPECIAL INTERSTATE FRUIT TRAINS.

For the week ending 9th April, three special fruit trains were dispatched by the Southern Queensland Fruitgrowers' Society, Limited, carrying the following fruit cargoes for the South, clearing at Wallangarra. Consignments would have been still larger had it not been for the heavy rains resulting in almost impassable roads, which prevented many growers from reaching the railway stations in time for dispatch.

Three hundred and seventeen and a-half tons were destined for Melbourne, and 117½ tons for Sydney. The description and quantities of the fruits sent South for Sydney were 8,281 cases, of which 6,354 were bananas, 1,579 pineapples, 343 cases of citrus fruit, and 6 cases chocos. For Melbourne there were 4,352 cases of bananas, 721 cases of pineapples, and 281 cases of citrus fruits.

District tonnage sent was: North Coast to Melbourne, 152¾ tons, and 36½ tons to Sydney; total, 189 tons (Landsborough transhipping 55¼ tons); Dayboro line to Melbourne, 12½ tons; Currumbin to Melbourne, 35 tons, and 3½ tons to Sydney (total, 38½ tons); Tweed Heads to Sydney, 75¾ tons.

Mr. W. Ellison, manager of the South Queensland Fruitgrowers' Society, lately reported that for the month of February the special trains chartered by the society carried a total of 1,753¾ tons of fruit—1,074 tons went to Melbourne and 679 tons to Sydney. In all, 46,500 cases were carried—28,400 bananas, 17,836 pines. The balance was made up of tomatoes, passions, &c. The loading for the past seven months was 7,925 tons, compared with 5,447 tons for the same period last year. For the two weeks ending 5th March, 1921, special trains carried a total of 1,085 tons of bananas, pines, &c., 645 tons being sent to Melbourne and 439 tons to Sydney. In addition to the above, fruit has also been attached from Stanthorpe.

WEEDICIDE.

A correspondent of "Land," Sydney, asks for information as to a good chemical for the destruction of weeds on a plot of ground 40 feet by 100 feet, and also wants to know whether any such application of a remedy would be injurious to trees, plants, and vegetables in three or four months' time. We ("Q.A.J.") do not know the virtues of all the forms of Weedicides, but the following useful reply was given by the journal named, and we commend it to the notice of Queensland gardeners:—

"As your piece of ground is not a large one, we would recommend 'Weedicite,' 1 gallon to 100 gallons of water. This quantity is sufficient to kill every surface plant on an area of 400 square yards. It will not injure trees, but do not allow the mixture to go on flower beds, as it rapidly destroys all vegetable life with which it comes into contact. Another remedy is arsenate of soda, 1 lb. to 2 gallons of water. A watering can is a good medium for spraying the poison. It is as injurious to plants as 'Weedicite,' and it must not be allowed to go on trees. If the grass and weeds are killed, you should allow three or four months before planting."

GAS POWER FROM WASTE WOOD.

"The progress which has been made by British firms in the construction of suction gas plants for utilising waste wood is of special interest to many countries overseas, where there are large quantities of this material available. These plants distil the wood and produce gas which is of excellent quality for use in gas engines. This method of utilisation is much more economical for power-producing purposes than burning under a boiler. A recent example of a large installation on these lines is afforded by a mine in a British dominion, where a British firm has supplied four suction gas plants capable of yielding a total output of 1,400 horse power. The fuel used is in the form of logs up to 2 feet long and a foot in diameter; and the gas is applied to the driving of four horizontal gas engines. Three of the engines drive electric generators, and the fourth is coupled to an air compressor for operating pneumatic drills and hammers in the mine."—"Industrial Publicity," London.

[There are vast quantities of waste wood in our forests all over Queensland, waste timber which will never be used for any purpose. From the above paragraph it would seem that such wood can be turned to very good account.—Ed. "Q.A.J."]

Tropical Industries.

THE SOUTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

During the month, cane areas have been inspected at Mount Bauple, Cooroy, Nambour, and Beenleigh.

MOUNT BAUPLE.—The prospects here are better than they have been for some years. The cane crops are growing strongly, and by cutting time, on present appearances, should yield both weight and density. This is more especially the case with the plant crop of last year, as cane planted previously to 1920 received a very severe check with drought; so much so that it is surprising to find the ratoons doing as well as they are. A certain amount of disease is noticeable in the field this year, although not to any great extent. The variety known as D. 1135 is, perhaps, the worst inspected, this cane being checked in places by a condition commonly known as ''red rot.'' The disease is distinguished by a rust coming on the leaf, and by a cracked and attenuated stem. Fungoid parasites make their appearances near the ground, and the root system, on examination, is parched and bound. Fortunately, only small areas are attacked, and if farmers plough out the diseased cane and let the land rest for twelve or eighteen months, the disease will probably disappear. Lime would be beneficial before replanting.

Regarding varieties, those at present doing well are M. 1900, D. 1135, H.Q. 813, H.Q. 222, D. 113, and Badila. There are a number of other canes being planted, having recently been obtained from Bundaberg Sugar Experiment Station. There are some good varieties among these, including Shah. No. 10, N.G. 81, Q. 1018, Q. 97, and E. K1. Practically no trouble is being experienced just now with cane pests. Borers are attacking the cane in isolated patches, but not sufficiently as to cause alarm. The Mount Bauple area generally looks very green, the pasture being in good condition. Live stock are doing well.

COOROY.—Very little cane is grown at Cooroy, although some farmers are seriously thinking of planting on a larger scale than hitherto. The country is so suitable for dairying and fruit raising that it is questionable whether anything else would pay as well. Transport is also a serious problem as far as sugar-cane is concerned. Of the few farmers who have a little planted, it can be said that they have worked hard, and the cane is growing well. The land, however, is inclined to acidity, and better results could be obtained with liming. D. 1135 is the principal variety grown. Frosts are occasionally severe between May and September.

NAMBOUR.—Owing to continuous heavy rains, not a great deal was seen of the Nambour district during this visit. The crop is, however, going to be a good one. Both the plant and ratoon crops are looking well, and will probably put on a couple of feet of cane yet before the season closes. As far as could be observed, the cutting season will begin fairly early.

No new varieties were noticeable since last visiting Nambour. On present appearances 1900 Seedling, D. 1135, H.Q. 285, and H.Q. 813 seem to be making the most satisfactory growth. There are three important items that the growers could give more attention to in this district, and they are, liming, green manuring, and draining. By paying attention to these matters, the growers would increase their tonnages considerably.

BEENLEIGH.—Much of the country in this fertile district is devoted to pursuits other than cane growing, but there are still a number of farmers who grow cane, though they are not entirely dependent on it. Most of the land around Beenleigh would produce sugar, although it is not ideal owing to the likelihood of frosts, which sometimes occur with considerable severity between May and October.

However, the different varieties of cane that are being raised at present look well, and there should be a fair quantity for milling next season. Probably the best grown of these, and the most promising, is the H.Q.813. One grower, Mr. Rowe, has a particularly fine planting of this cane, and growers would be well advised to give it a fair trial. Other varieties, such as 1900 Seedling and D. 1135, are making good headway. The soil requires lime and green manures; also a little more drainage on the river farms would be beneficial. The cane is practically free from injurious pests. Occasionally grubs are in evidence, but so far have done no damage. River transport is at present difficult owing to the tremendous masses of water lilies.

BUNDABERG (WOONGARRA AND BAROLIN).—The prospects for a good season look better in the Bundaberg district than they have done for some time. The cane is growing satisfactorily, and farmers are confident that they will get a fair return this year. The season has been a good one since the New Year, and the soil is in a suitable condition. With the disappearance of the old drought-stricken cane that was on many of the fields prior to last planting, a considerable slackening off is noticeable in cane pest attack, although it would still be as well for the farmers not to have any useless cane stand on the land for horse feed, &c., as this precedure encourages borers, and forms feeding grounds for the cane grub. There is no doubt that a great deal of the soil in the Woongarra and Barolin areas would be benefited by the greater use of vegetable manures, either cow pea or Mauritius beans.

Since last reporting on the above areas, the different varieties distributed by the Experiment Stations have made good growth. At present the five most suitable varieties of the older canes appear to be D. 1135, 1900 Seedling, H.Q. 285, Badila, and Clark's Seedling, H.Q. 285 looks particularly well and growers ought to plant more of this cane. It is an early maturing variety of good sugar content.

THE NORTHERN SUGAR DISTRICTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Northern Field Assistant, Mr. E. H. Osborn:—

The Ayr District, comprising the Haughton Mill, Pioneer, Kalamia, and Inkerman was visited recently, and the following notes were taken:—Everywhere land is being prepared to plant from April onwards. Tractors, mostly Mogill and Titan, are in use, but the heavy cost of fuel makes their use very expensive now, and in consequence horses are doing most of the work.

The bulk of the soil here consists of heavy, dark, deep loam upon and adjacent to the river bank and creeks; and a somewhat similar class of lighter soil, but more shallow upon the higher grounds. All of it is, I think, capable of growing first-class crops of high density cane if only an average rainfall, evenly distributed, eventuates. No rocks or gravel are to be seen. As regards lime, I understand that good lime can be obtained from the Reed River at a reasonable cost. Green manuring has not been gone in for much, as several farmers tried to procure same and failed. Mrs. Hayward, near Inkerman, has a very nice block of first ratoons—half Badila and half Clark's Seedling—as the result of a heavy application of filter press manure obtained from Inkerman. The cane looks remarkably green and healthy now.

Very little irrigation is carried on at the Haughton, although the cane looks very well without it. Probably this is accounted for by the extra rain that this district always gets. For instance, in three days in March, 14.45 inches fell there, whilst up to the 27th of March under 6 inches was the total for Ayr.

At Pioneer and Kalamia, irrigation is usual; whilst at Inkerman, although plenty of plants are being used with good results, the majority of growers are awaiting the completion of the irrigation scheme. This will increase the Inkerman supply very materially.

Taking the general outlook from a cane point of view, the cane, although very green and well stooled out, is backward owing to the dry spell in February. As one grower remarked, "It is a bit over the odds to have to think of watering in our wet season (February and March)." Unless a fall occurs very soon a lot of the farmers talk of watering again.

The varieties of cane most grown here are Badila (about 40 per cent. of crop), the Gorns, 24, 24a, 24b, Clark's Seedling, B.208, Q.813, Q.855. Of the last two, Q.813 is most popular, on account of its better striking qualities. Very little ratooning is done beyond the first, except on the best of the soils, as it is said not to be too payable. On some of the better soils second and third ratoons have been more successful. The mills expect to start crushing early in July; and, although it is hard to get an accurate estimate of the total tonnage, it should probably be in the vicinity of 240,000 tons, *i.e.*:—

Haughton	25,000 tons
Pioneer	70,000 tons
Kalamia	65,000 tons
Inkerman	80,000 tons
	240,000 tons

This amount will, of course, depend upon the weather in the near future, to a certain extent.

This district has so far been very free from disease or insect pests, although a few grubs were in evidence at the Haughton last year.

Mr. Wright, a grower there who suffered a little from them, replanted and used about 40 lb. of arsenic to the acre with his cane plants. He used it after the plants had been slightly covered with soil, and then added the balance of soil covering. The results of this experiment will be instructive.

In conclusion, I would like to thank the various gentlemen who gave me all the information at their command, and in fact helped me in every way that they could. Such assistance is much appreciated.

OF INTEREST TO TOBACCO-GROWERS.

Tobacco growers in Queensland who no longer have the advantage of the valuable instruction given by the late Mr. Neville, who, for several years directed the industry, both in the south and far north of Queensland, will doubtless find some information which will be of advantage to them in the following article by W. H. Scherffius, M.S., Chief of the Division of Tobacco and Cotton, Ceylon, taken from the February, 1921, issue of the "Tropical Agriculturist," Peradeniya, Ceylon:—

FACTORS THAT AFFECT THE GROWTH, REPRODUCTION, AND MATURITY OF TOBACCO.

The various factors that affect the development of a crop of tobacco are numerous. Probably the most important are light, temperature, moisture, chemical changes, and fertility of soil.

Light.—I have purposely mentioned light first, as too frequently we attach more importance to the other factors mentioned and leave light out of consideration. A number of investigators have given special attention to this phase of plant life, and their results have indicated that light plays a most important part in the growth and reproduction of plants. This topic might be viewed from three directions, namely: (1) Intensity of the light; (2) the quality—that is, the wave lengths of the radiation; and (3) the duration.

As regards intensity of the light, there seems to be an optimum amount suited for each plant species, and that optimum may be more or less than the full intensity of the sun's light on a clear day in a particular quarter of the globe. Within certain limits a reduction of the intensity of the light has a tendency to lengthen the axis and branches and also to increase the superficial area of leaf surface of a good many species of plants.

The effects produced by different spectrum rays are very marked, though nothing very decisive can be stated at present. Under the influence of red rays of light certain species of plants show an abnormal elongation of the axis, while under green and blue rays the length of the axis is markedly reduced. Some plants show the greatest growth under white light.

The duration of daily exposure to light seems to have an important bearing on the period of vegetative growth of certain species, the lengthening of the daylight period, showing a considerable shortening of the period of vegetative growth, larger seeds produced, and an increase in the flavour and aroma. The exclusion of light prevents the development and functioning of the seed-forming agents, or sexual reproduction; on the other hand, the length of the seasonal daylight, or if supplemented by artificial light, is a dominant factor in developing the staminate and pistillata reproductive organs, and, therefore, the existance of the species.

Only moderate shortening or lengthening of the daylight period tends to retard or accelerate, as the case may be, the sexual reproduction. If the daylight period is too short for production of seed the plant tends to gigantism or indefinite vegetative development; while under the influence of the correct length of daylight for a particular species an abundant flowering and fruiting may be expected. Thus certain varieties may act as late or early maturing, depending on the amount of daylight they may be exposed to as compared to the optimum requirements of that species or variety.

Annuals, biennials, and perennials may also be the results of seasonal range of daylight, as many species are, in a measure, governed by length of daylight rather than the retarding influence of winter. Therefore, certain annuals may complete

two cycles of reproduction in a single season by subjecting the plants to a suitable length of daylight or artificial light. Similarly, under certain reduced light exposures, some annuals behave like non-flowering perennials.

Apparently the rate of growth is directly proportionate to the length of daily light exposure.

From the above one would conclude that the proper time for seeding in order to get the correct amount of sunlight is important, and that the seasonal range of daylight is an important factor in controlling the natural distribution of plants.

Temperature and Moisture.—The various factors mentioned previously are so vitally dependent one upon the other that it is important to bear in mind that one of these factors, such as temperature, will not give results approaching perfection without the other conditions being favourable to the production of the crop. Tobacco is a plant which is very sensitive to its surroundings, and we must not expect a good development if the conditions under which we compel the plant to grow are unfavourable. To obtain the fullest development in growth the plant requires a humid atmosphere and a fairly high temperature, though in my opinion it attains its greatest perfection in temperate zone heat. It has, however, been very clearly demonstrated that certain varieties or types of tobacco will make good development under the influence of high temperature, while others show poor development. A notable example of this is found in the White Burley types. They seem to reach the highest degree of perfection in the Blue Grass Region of Kentucky; there is, however, another factor which plays a vital part in this connection which will be mentioned later. White Barley tobacco, when planted in this country, with occasional expections, seems to become somewhat dwarfed, and the different individuals show a lack of uniformity in their growth, and not infrequently the leaves show a parched or dried condition during the growing period. It seems to thrive best in rather a humid atmosphere and with a moderate temperature.

Cigar wrapper tobacco, which is probably the most highly specialised type grown, seems to thrive best and reach the highest degree of perfection in growth, flavour, and aroma, in a high temperature with a fair amount of humidity. During the curing or drying stage, to obtain the best results, the tobacco planter must use his best judgment in this process, as the method of handling his crop depends largely on the type of tobacco he is attempting to produce. For example, in the production of cigar wrappers the curing process is an alternating one, in which the tobacco should partially dry during the day and at night it should absorb a certain amount of moisture; this process is called ''running''—*i.e.*, the cured portion of the tobacco gradually changes from a yellow or green colour to a light mahogany brown. In the production of so-called Virginian tobacco the process is somewhat different; to secure the greatest amount of light-coloured leaf the planter must for the first few days during the yellowing process prevent curing, by keeping the atmosphere humid, till the tobacco is properly yellow; then the curing process is commenced and is continued constantly to prevent ''running'' till the tobacco is thoroughly dried. The relative amount of humidity and heat necessary both during the yellowing period and the curing period are highly important, as the results obtained depend largely on these factors.

The ageing or fermenting process should not be attempted by the farmer where a warehouse is available, as it is purely a warehouse operation, and can only be done properly where large quantities of tobacco are brought together and where suitable buildings are available.

Chemical Changes.—During the growing period there are certain plant foods which become water soluble and are drawn into the plant by means of fine root hairs on the plant. These plant foods—nitrogen, potash, and phosphorus, in addition to certain other minerals such as lime, magnesium, sulphur, iron, and carbon—are essential in building up the cell structure of the plant. During the growth, curing, and fermentation of a crop of tobacco there are complex chemical changes constantly going on; starches are converted to sugar, alkaloidal poisons are built up and broken down, nitrogen is probably used up in this process and again liberated in the fermentation process. This continuous chemical change is illustrated by the varying amounts of nicotine found in tobacco at different stages. Generally speaking, as a plant develops, there is a gradual increase in the nicotine. Seedlings at transplanting time will show approximately .25 per cent. of nicotine, and at full maturity the plant may show 4 per cent. of nicotine; if allowed to stand longer in the field and become over-ripe it will show a slight falling in the nicotine content. Likewise, during the fermentation process, there is a reduction in the nicotine content.

If one follows these changes, we see starch form and disappear, sugar form and disappear, nitrates and nicotine increase and again decrease. Citric, oxalic, and

malic acids are present in the growing plants, and these partially disappear in the cured leaf. Butyric and acetic acids are present in fermented leaf. During the fermentation process gases are formed by the breaking down of certain compounds; ammonia is one of these gases, which is easily detected by the odour in the fermenting room. Thus it is apparent that after a crop of tobacco reaches the curing-shed it is highly important that the curing and fermenting be carried out with the greatest care in order that the best qualities may be obtained.

Fertility of Soil.—The question of the fertility of the soil is one which, though often discussed, is of such importance that I feel justified in making a few comments on it before closing. I would first like to impress the fact that the quantity of plant food in the agricultural zone of the soil is a definite quantity, and every crop grown on that soil takes away a portion of that definite quantity. So it becomes a simple matter of reasoning, that if one continues to draw on that stock of plant food without replacing it by means of fertilisers or by growing deep-rooted manuring crops, he must expect in a few years to see a falling off in yields. Again, constant cropping without ploughing under manuring crops will reduce the humus or decaying vegetable matter in the soil to such an extent that, although there may be sufficient nitrogen, potash, and phosphorus to produce crops, the soil may be lifeless. This decaying vegetable matter acts like a sponge in holding moisture in the soil and also provides a habitat for the soil bacteria, which is so essential to plant life.

Tobacco, which is sometimes spoken of as a potash plant, requires a fair amount of plant food; therefore, if a soil is not giving good yields, for lack of plant food, it is probably advisable to apply a complete fertiliser carrying, say, 4 per cent. of potash, 3 per cent. of nitrogen, and 8 or 10 per cent. phosphoric oxide. I would, however, advise caution in the use of nitrogen, especially in attempting to produce yellow tobacco. Nitrogen has a tendency to produce a stronger, heavier, and darker tobacco. Potash should not be used for tobacco in the form of a chloride, as chlorine is generally conceded to be injurious to the burning quality of tobacco. Phosphoric oxide seem to give an earlier maturity and a lighter-coloured leaf. Previously we mentioned the Blue Grass Region of Kentucky as the favourite home of the White Burley tobacco. Underlying this area is a stratum of limestone, and the surface soil contains decomposed limestone, and incidentally this soil shows a high percentage of available phosphoric oxide. It is probably the phosphorus or the combination of phosphorus and lime together with a temperate heat that makes this section ideal for the production of this particular type of tobacco.

RICE-GROWING.

By A. J. BOYD.

Having seen rice growing in Java and some other tropical countries, it struck me that the soils and climate of Queensland would be just as suitable for the successful cultivation of this cereal in Queensland. I therefore obtained some ''paddy'' (rice seed) and sowed it on my sugar plantation Ormeau, at Pimpama, in 1869. It throve splendidly. The seed was one of the Japan varieties. Since that time, from the seed thus raised and distributed, other settlers took the matter up, and it was not long before about 300 acres were under the crop. In 1901 Mr. F. W. Peek, of Loganholme, wrote in the December issue of the ''Q. A. Journal,'' an exhaustive account of the initiation, rise, and progress of the rice industry, giving full directions for sowing, cultivating, harvesting, and threshing out the grain, milling the rice, and preparing the crop for market. In the year mentioned the Brisbane ''Observer'' wrote as follows concerning a sample of rice grown on Pimpama Island:—''The rice resembles Patna rice in shape of grain, but is of darker colour. Qualified experts, to whom it was shown, said it was the first really high-grade rice they had seen grown in this State, and as it could be marketed (in 1869) at from £18 to £18 10s., it commanded a ready sale. The commonest quality of imported rice, Rangoon, was then selling at £19, duty paid, while for Japan rice £24, duty paid, was asked by the distributing houses. There is no more trouble in sowing and harvesting a rice crop (Upland Rice) than in the case of a wheat crop.''

Like every other cereal or vegetable, rice, to ensure good results, must have a certain amount of attention and care in preparing the land, although the question of drainage does not enter so largely into consideration for this crop as for other cereals. Stagnant water should be avoided as detrimental. I do not here deal with swamp rice, which is raised in seed beds, planted out in wet land, and inundated at

intervals almost up to the ear. Such rice can only be profitably grown in countries like Java, China, and other countries where there is an abundance of cheap coloured labour. The so-called Upland rice is raised without transplanting, and with no more irrigation than is required for wheat, barley, or oats. The variety successfully grown in the Logan district and at Cairns in the far North was the "White Java," which gives a length of straw of from 4 to 6 feet, with a good flag, besides a grain of good length, fairly plump, and the variety is also free from disease or rust.

"In preparing the land," said Mr. Peek in his paper on rice-growing, "ordinary methods only need be adopted—that is, to first plough, leaving the soil to lie for a week or so to aerate and sweeten. Then, cross-plough and harrow, bringing the soil to as fine a tilth as possible. The best time for planting in Southern Queensland (south of Rockhampton) is at the end of September or the beginning of October, when we get the first rains. In cultivating for rice on hillsides or sloping land with a natural rapid drainage, it would be advantageous to slightly terrace the land cross-ways to the fall of the hill, leaving an open catchment drain on the higher side, and blocked at each end to conserve the rain water, because even so-called Upland rice must have a certain amount of moisture, and by the construction of the above drain, or dam, so to speak, the gradual percolation of the conserved water will have the desired effect of helping to supply the necessary moisture, which would be about 20 to 30 inches of rainfall spread over the period of growth. This amount of rainfall has produced very good crops of grain. Now, about sowing the seed: We have to be determined in the matter by our requirements—if for cropping for grain, or for fodder purposes only. There are three systems: Broadcast, chiefly for fodder purposes; planting in drills; and transplanting from nursery beds. In the first instance—*i.e.*, sowing broadcast—it will take a bushel (60 lb. of paddy) to the acre, the seed being harrowed and treated in the same manner as for oats or wheat in the after cultivation. But the plan most generally adopted, and by far the best, is planting the rice in drills 2 feet 6 inches or 3 feet apart, and about 10 to 12 inches between the plants, which may be done successfully with an automatic seeder. By this method, about 35 to 40 lb. of seed to the acre are required. It ensures the crop being more even and not so patchy as when sown broadcast, and allows a better chance of going through the crop with hoe or cultivator to remove any weeds that may have made their appearance before the rice has got fairly started.

We need not describe the methods adopted to raise a crop of swamp rice, as it is very unlikely that this variety of cereal will ever find favour in a White Australia. One might as well try to transplant a field of oats or wheat and expect to get a profit.

The usual method pursued in harvesting rice is to cut with the ordinary sickle or reaping-hook, although where large areas are planted it is thought that the latest wheat-harvesting machinery could be used effectively.

The time for harvesting is whilst the stalks have still a bronze-green appearance, and the heads have turned a golden brown about half-way down and appear what a wheat farmer, or an inexperienced person, would call three parts ripe.

As many as thirty or forty heads have been produced from a single grain planted, the product weighing from 10 to 14 oz. By cutting rice at this stage, the loss by shedding is not so great as with over-ripe grain. Rice is never left stooked in the field, but is treated as quickly as possible.

After threshing, a great deal of nutriment remains in the stalk, which makes excellent stock food and also good ensilage.

The market for rice in Australia is a growing one, and it will take years before the supply overtakes the demand. Our farmers need not fear to grow this crop and invest in the industry, which will return a fair amount of profit for the labour and outlay required to produce an article which only requires care in selecting and planting the varieties to suit the market requirements.

The machinery needed for hulling and polishing the grain is comparatively inexpensive.

Messrs. Whitmore and Binyon, Limited, Mark Lane, London, are makers of rice mills ranging in hourly output of hulled and pearled rice from 7½ cwt. to 20 tons per hour.

Some years ago, Mr. W. Heck, a sugar planter on Pimpama Island, imported a little rice mill, capable of treating half a ton of dressed rice per day, as an adjunct to his sugar mill. With this machine he turned out a finished, polished product which was pronounced by Brisbane merchants to be equal to any imported rice of the same variety, and very little different to the best Japanese rice.

The rice crop in 1898 in Queensland covered 863 acres, and averaged 44.19 bushels per acre, the total yield amounting to 38,133 bushels of 60 lb. To-day it is one of the neglected industries, yet we import annually over 2,000 tons, for which we pay—for Patna and Japanese rice, £60 per ton. Chinese rice is imported in mats containing from 49 to 50 lb. each, for which importers pay from 18s. 6d. to 20s. per mat, or about £37 to £40 per ton.

As the cultivation of rice is practically the same as that for wheat, any wheat-grower can calculate for himself the cost of production and harvesting of paddy, and can thus judge whether it is a crop which will return him more than, or at least as much as, wheat or maize. Of course, the cost of threshing, hulling, and polishing must be taken into consideration. We understand that early in this year nine bales of paddy (rice for seeding purposes) were received from Japan for shipment to intending growers in the Cairns district.

SISAL HEMP IN JAMAICA.

A few years ago sisal hemp was produced to some extent in Queensland, and it proved a very profitable crop, but, eventually, the increase in wages, the higher cost of machinery, and the rise in freights, coupled with the hopeless competition with cheap coloured labour countries, the industry declined to a vanishing point. The East African sisal industry has suffered enormously through the abnormal conditions resulting from exchange difficulties. The results of trading during 1920 must have been to growers, shippers, and merchants most unsatisfactory. While prices for the first six months of the year were satisfactory, the subsequent drop during the rest of the year, combined with the heavy allowances for damaged hemp, and also for tow being shipped, instead of hemp, must have caused serious losses. British-grown sisal, best quality, is quoted by Messrs. Landauer and Co. at £51 to £52 per ton, and No. 2 at £46 to £48. Yet German sisal, which leaves much to be desired in quality, colour, and selection, is valued at from £53 to £54 for No. 1, and £47 to £48 for No. 2. Tow is quoted at £30 to £32, according to quality.

The Director of Agriculture, Jamaica, Mr. H. H. Cousins, made the following report in November last on the result of testing the second crop of fibre from the experimental 1,000 plants at Lititz of the sisal of the 1915 planting, cut in November last:—

TESTS OF FIBRE YIELDS AT LITITZ.

	Cut Nov., 1919.	Cut Nov., 1920.
Average number of leaves fit to be cut per plant	32	30
Average yield of leaves in lb. per plant ..	19	18
Average weight of single leaf	9.6 oz.	9.7 oz
Recovery of fibre (by hand) per cent.	3.4	3.93
Fibre per 1,000 plants, lb.	646	759
Yield per acre of fibre (6 x 5) at normal distance of 6 feet x 5 feet	938	1,029
Total	2 cuttings, 1,967 lb.	

These results are quite encouraging, as the drought at Lititz in 1920 has been very severe and the experimental site is considered to be the most infertile area on the whole of the Lititz Savannah.

While the leaves average slightly more in weight than last year, the percentage af fibre has increased from 3.4 to 3.93 and the gross return of fibre is now indicated to be at the rate of 1,079 lb. of fibre per acre, as against 938 lb. per acre for 1919 for the first crop.

In less than a year we have thus obtained from this test area 1,967 lb. of fibre per acre worth about £40 in London to-day. We should get four crops before the plants are exhausted so as to get about 4,000 lb. of fibre per acre before replanting becomes necessary.

It is therefore evident that the growing of sisal for fibre at Lititz should be a profitable undertaking.—"Journal of the Jamaica Agricultural Society," January, 1921.

Botany.

A WILD COTTON.*

By C. T. WHITE, F.L.S., Government Botanist.

Writing under date 10th December, 1920, to the Minister for Agriculture (Hon. W. N. Gillies), Mr. F. Pether stated:—"I enclose for your inspection a sample of wild cotton found by me growing on poor sandstone hills near the Mayne River. The cotton bush only grows a foot high, but the whole of it is nearly all cotton and is easily stripped from the stem, which bears only a few soft leaves."

The sample sent was a very small one and insufficient for botanical identification other than it showed it to come from some plant of the family Chenopodiaceæ or Salsolaceæ, a family containing the Salt Bushes and Goosefoots.

Mr. Daniel Jones, who examined the specimen, reported that "It was the first example of a native fibre approaching true cotton he had seen, but that, owing to its short staple, its commercial value would not be much, although it might be used as a substitute for kapok." It is not likely, however, that it would pay to collect for this purpose, as kapoks are available from a number of more readily available sources.

Later (14th January, 1921), Mr. Pether forwarded complete specimens of the plant, with the following accompanying notes:—"The sample now being forwarded is what I pulled from the ground just as it was growing. As you will see, the root was broken in the pulling. The fibre forms in the shape of a flower with a tiny seed in the centre. The sample which I have now forwarded was just on the turn of ripening. The tip of the plant was green. The cotton ripens from the bottom of the stem upwards and falls away as it ripens. I first discovered the plant in September, 1920, after there had been good winter rain. As far as my knowledge of the plant goes, I should think it would reach maturity in three months, but so long as the ground kept moist, it would keep green, as it appears to grow and ripen much the same as the natural grasses. It grows where the natural grasses would not grow, the land being too poor for them. The nature of the land on which it grows is nearly sandstone rock, or perhaps better described as sand which has crumbled with age from a sandstone rocky hill. This sandy soil also bears a small quantity of ironstone. There is no doubt about the plant being hardy, and I should think very little rain would keep it going. I have only been to the cotton patch once or twice. It was then ripe, and had mostly all fallen from the stalk, but still having a small quantity hanging from the plant, the fibre lying on the ground in heaps. The country in the vicinity of which this plant is growing is very poor sandstone country, and this one patch of cotton is the only one that I know of. I have also shown it to old hands, but no one has ever seen the plant growing. I showed it to Mr. Murray, manager of Brighton Downs Station, on the Diamantina, who is a very old identity here, and who has been all over this country; but he had not seen it before; therefore, I think this is probably the only patch where it grows in the district. The locality is roughly about twenty-six miles east of the junction of the Mayne and Diamantina Rivers."

On examination, the specimen proved to be a species of *Bassia,* and one apparently new to science. Strange to say, the nearest ally of Mr. Pether's plant is *Bassia carnosa,* a species only known to occur in a few coastal localities in Western Australia. The Queensland plant very closely resembles the Western Australian one, but the cotton surrounding the seed is considerably longer. A description and illustration is given herewith.

BASSIA LANUGINOSA, sp. nov.

Fruticulus erectus ca. 30 cm. altus; ramis dense lanuginosis; foliis sericeo-tomentosis sessilibus linearibus ca. 2.5 cm. longis 2 mm. latis vel superioribus subovatis ca. .9—1.1 cm. longis et 3.5 mm. latis; floribus axillaribus solitariis pilis albis longis obsitis, stigmatibus 2; perianthio fructifero depresso, pericarpio depresso-ovoideo membranaceo pilis paucis longis obsitis.

A small undershrub about a foot high with numerous erect simple stems arising from a hard branching woody base. Stems covered with a dense, long, floccose

* As this article describes a new plant, it is necessarily somewhat technical. A brief Latin diagnosis is included in accordance with the International rules of botanical nomenclature.

PLATE 24.—A "WILD COTTON," (*Bassia lanuginosa*). Slightly reduced.

tomentum. Leaves sessile, linear or the uppermost ones more or less ovate, lower ones about 1 inch (2.5 cm.) long, about 1 line (2 mm.) broad, uppermost ones 4 to 5 lines long (.9—1.1) and 1½ to 2 lines (3-5 mm.) broad, densely covered with long silky or cottony hairs. Flowers sessile and solitary in each axil, but crowded along the upper part of the stem, densely enveloped in long white silky-woolly hairs. Fruiting perianth depressed; about 2 lines in diameter without the wool, but over 1 inch in diameter with the wool teased out, the 5 lobes closing over the fruit and surrounded by a slightly raised horizontal ridge, but without appendages of any sort. Stamens 5, styles 2, united to about the middle. Pericarp, about 1 line in diameter, depressed-ovoid, membranous with a few long hairs.

Habitat.—Sandstone country about twenty-six miles east of the junction of the Mayne and Diamantina Rivers, Western Queensland, *Frank Pether.*

The nearest ally of this new species is *Bassia carnosa*, a Western Australian species, from which it can be distinguished as follows:—

> Leaves at length glabrous; flowers in terminal leafy spikes; fruiting perianth 1 line in diameter without the wool, including the wool about 3 lines ....*B. carnosa.*
>
> Leaves never glabrous, flowers not collected in definite terminal spikes, but occupying the whole of the upper part of the stem, sometimes almost the entire stem, fruiting perianth 2 lines in diameter without the wool, about 1 inch, including the wool teased out.............*B. lanuginosa.*

Notes on the Genus Bassia.—The genus Bassia comprised about 40 species, found in Southern Europe, Northern Africa, and temperate Asia, but finding its greatest development in the drier parts of Australia. The fruits of many are more or less spiny and covered with down or short woolly hairs. The genus was founded by the Italian botanist Allioni in 1776 on *B. muricata,* a Southern European species. In the ''Flora Australiensis'' the genus is divided into three smaller ones, *e.g., Chenolea, Aniscantha,* and *Slcerolaena.*

These are separated by only small differences, and none have priority over Bassia as a name. In 1771 the German botanist Koenig established a genus called *Bassia* on an East Indian tree, and in many works Koenig's genus stands for a number of tropical trees of the family Sapotaceæ. Most modern writers, however, now generally accept Allioni's genus as having priority, and the Sapotaceous one was changed by Baron von Mueller to *Illipe,* which latter name is now generally held.

These notes are necessary to explain the departure from the nomenclature in the ''Flora Australiensis'' and Bailey's ''Queensland Flora.''

TO MAKE CHARCOAL.

In the early days of the Chiltern goldfield, Victoria, there was a great demand for charcoal by the smiths, who had hundreds of miners' picks to sharpen. The only supply at first was obtained from charred logs, but several Italians went into the business, amongst them being men who had been charcoal-burners in their own country. Their mode of procedure was as follows:—

The principal timber trees were stringy-bark, and these men felled the trees and stripped off sheets of bark, which sold for 2s. 6d. per sheet for roofing the houses of the incipient township. They then split up the logs into lengths of from 3 to 6 feet. A stout post was placed upright on the site selected for a charcoal kiln, and small wood gradually extending to the longest billets was built up against it in the shape of a beehive. This was covered with grass, and about a foot thick of dry earth thrown over the grass. Small openings were left here and there on the ground floor to create a draught. Then the post was lifted out, and fire dropped into the chimney so produced. From this time forward a watch was kept night and day on the pile, and at any sign of fire breaking through, fresh earth was piled on. Some of these kilns would produce from 20 to 50 bags of charcoal. In about 36 hours the pile of burning timber began to subside, and eventually buckets of water were poured down from the top to extinguish the fire. On opening up the kiln the whole mass of timber was reduced to charcoal, which was spread out to cool on a cleared space, the lumps of charcoal being carefully separated, for wherever any of it happened to be still red hot it would communicate the fire to the rest, which would, in the open air, be reduced to ashes. The charcoal found ready sale at 2s. 6d. per bag. A community of Italians would sometimes have half a dozen of their kilns in operation at the same time.

Forestry.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Government Botanist.

No. 2.

GIANT WATER GUM (*Eugenia Francisii*).

Common Name.—Giant Water Gum.

Derivation.—*Eugenia*, in honour of Prince Eugene of Savoy, an early protector and encourager of botany; *Francisii*, after William Douglas Francis.

Description.—A very large tree attaining 130 feet in height and a barrel diameter of 5 feet. Barrel mostly very widely and prominently flanged at the base. Bark brown or grey, smooth or with occasional partly detached fairly long flakes; when cut, brown, measuring ⅜-inch thick on a tree with a barrel diameter of 3 feet 6 inches. Sapwood white. Leaf stalks about ¼-inch long. Leaves opposite, somewhat egg-shaped or elliptical in outline, drawn out into a prominent point at the apex, upper surface dark green and glossy, underside paler, midrib and the numerous fine lateral nerves visible on both surfaces; measurement of leaf blade, 1½ to 3 inches long, twice to 2½ times as long as broad. Minute transparent dots (oil cells) are seen in the leaves of this and allied species when they are held between the eye and a strong light. Flowers in panicles at the ends of the branchlets and proceeding from the forks of the leaves. Stem and branches of panicles slender and often 4-angled. The flowers are borne at the end of the panicles branches in little clusters of 3 to 6. The individual flowers are very small, measuring less than ¼-inch long and are borne on a slender stalk of about one-tenth of an inch. The calyx and tube which forms the lowermost part of the flower is bell-shaped and bears 4 short, broad teeth at its rim. Within the calyx teeth are 4 round, yellowish petals about one-tenth of an inch in diameter. Within the ring of petals are numerous fine stamens about one-sixth of an inch long. The ovary fills the lower part of the calyx tube, and is surmounted by a style about as long as the stamens. Fruit bluish purple, often paler, round and somewhat flattened, nearly ½-inch in diameter and ¼-inch in depth, consisting of a mealy pulp surrounding a comparatively large seed.

Distribution.—Coastal scrubs of Eastern Australia from the Richmond River, N.S.W., to Gympie, Queensland. It is a very common tree in the scrubs eastward of Gympie, and is frequent along watercourses and on damp flats. Confined to Australia.

Uses.—The close-grained, pinkish timber has not been used so far as we know. It is easily worked, and could at least be used for cases.

Remarks.—The name "Water Gum" originated from the fact that quantities of a watery sap are sometimes contained in a central cavity or pipe of the barrel, and it flows out when the trees are being felled. We have called it Giant Water Gum to distinguish it from other smaller and hard-wooded trees, also called "Water Gums" in Queensland.

References.—*Eugenia Francisii*, F. M. Bailey, "Queensland Agricultural Journal" vol. 26, page 315, pl. 31 (1911). We are unable to separate this species from *Eugenia Tomlinsii*, Maiden and Betche, "Proceedings of the Linnean Society of New South Wales" vol. 27, page 247 (1913), and have taken this view in giving the distribution of the tree.

16

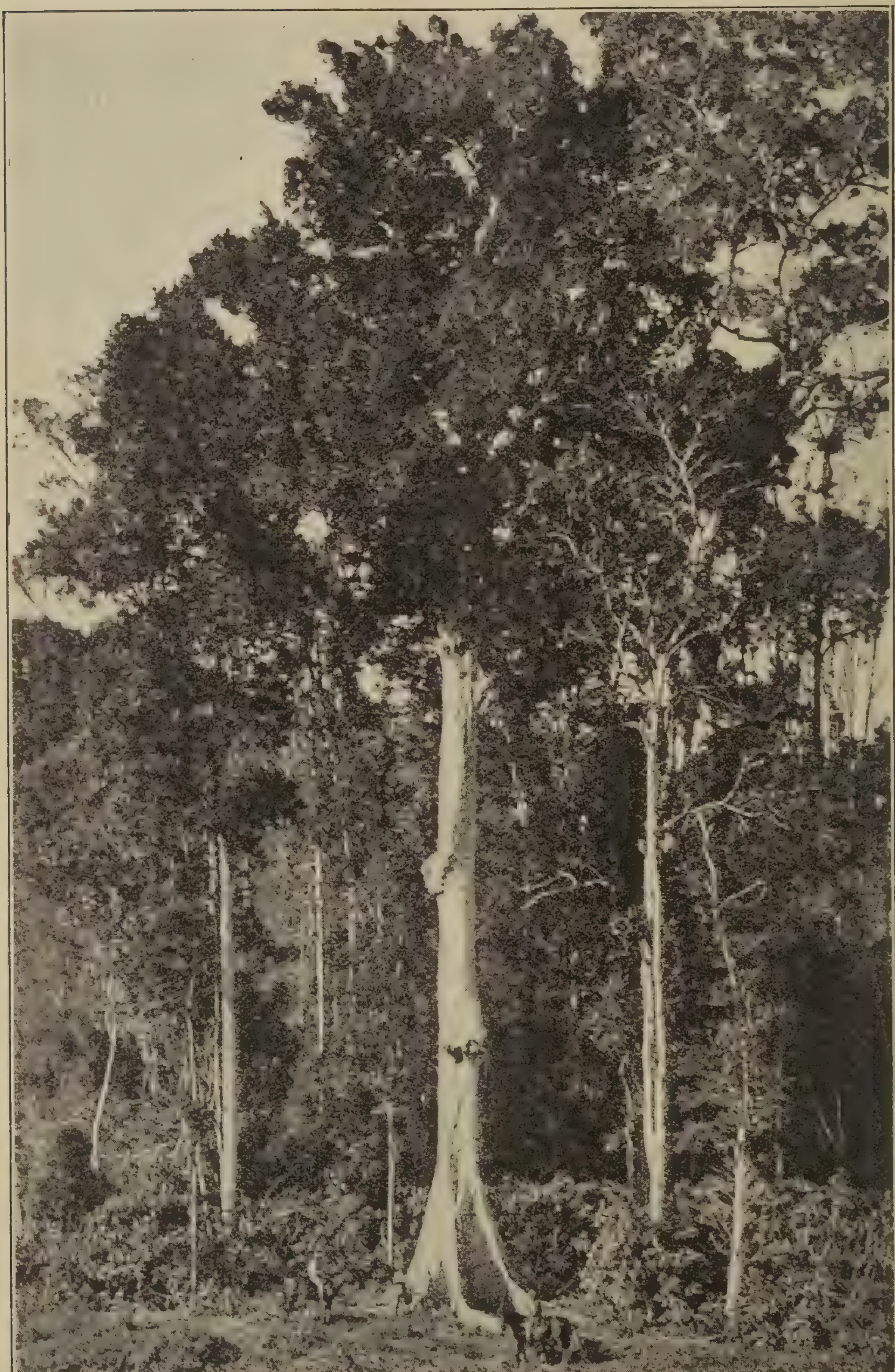

Photo. by the authors.]

PLATE 24.—GIANT WATER GUM (*Eugenia Francisii*). Kin Kin.

Three men, two on horseback and one on foot, may be seen near the base of the tree.

PLATE 25.—GIANT WATER GUM (*Eugenia Francisii*).

A. Branchlet showing inflorescence.
B. Branchlet showing very young fruit.
C. Inflorescence.
D. Branchlet from barren shoot, showing underside of leaves.

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon Cane Grub Investigation from Dr. J. F. Illingworth, the Entomologist to the Bureau:—

Rains have continued during the past month, so that the soil is now (15th March) thoroughly saturated and all the watercourses are flooded bank high. Between showers the weather has been exceedingly oppressive; hence, conditions could hardly have been better for the growing crops. Fortunately, too, these tropical disturbances have not developed much wind, so most of the cane is standing well. Babinda district, as usual, has come in for her full share of the deluge—an average of about an inch per day for the months of January, February, and March—yet the cane there is making splendid growth.

Grub injury is beginning to show at Greenhills; and arsenic where used in sufficient amount, is already showing encouraging results.

DEVELOPMENT OF LEPIDODERMA ALBOHIRTUM.

This species, as usual, has developed very rapidly in the red-volcanic soils. Digging in the fields at Greenhills, on 11th March, showed that 73 per cent. of the grubs had already reached the third stage, which is the period in their development when they are most destructive; 26 per cent. were in the second stage, and only about 1 per cent. still remained in the first stage. Since straggling beetles were on the wing up to about the middle of February, the duration of the first and second stages is apparently something less than a month each. The final stage, on the other hand, remains with us right up to cold weather, and even then the grubs frequently continue for several months deeper in the soil in their hibernating chambers.

In spite of the super-saturation of the soil, much of the cane at Greenhills already looks as if it were suffering from extreme drought—*i.e.*, the terminal leaves are rolling, giving the characteristic piping appearance, and the beautiful dark-portions of the stalks badly gnawed. During the prevailing wet weather the grubs are particularly abundant, the leaves have become almost dry and brown in colour. Stools of cane in this condition can easily be lifted right out of the ground with one hand, for the roots have been eaten entirely away and even the underground portions of the stalks badly gnawed. During the prevailing wet weather the grubs are just under the surface of the soil and near the cane, so that when the stools are pulled out bodily most of the grubs are disclosed. These vary in numbers considerably in different parts of the field, chiefly with regard to the distance to the feeding trees, but it is not at all uncommon to find twenty to fifty in a single stool, especially in the ratoon cane.

ARSENIC FOR CONTROL OF CANE GRUBS.

Most of the plant cane on the Greenhills Estate was treated with arsenic at the time of planting, the poison being placed in the drill at the rate of about 80 lb. per acre. This cane has made excellent growth, except in a few places on the rising ground, where grub-injury is already showing.

In our two experimental fields on this estate we have forty-six plots, each having a width of five rows (25 ft.). Right through, the treated plots alternate with checks, so that we may get a better line on the real effect of the poison. As was noted almost a year ago, we used arsenic in the following amounts per acre: 40 lb., 80 lb., 100 lb., and 200 lb. One field was planted to D. 1135 and the other to Badila. The first was planted in April, 1920, so that there is fully 7 ft. of cane on it. The poisoned areas were treated during May, 1920, when the cane was almost a foot high, but before the drills were filled. This field has always been one to show grub-injury first, so, as usual, much of the cane is already (15th March) suffering there. Most of the checks have fallen, due to the excessive wet weather, while the treated plots show varying degrees of immunity. On 11th March, I was much interested to find the cane in the plot treated with arsenic at the rate of 200 lb. per acre standing erect, while the check plots at either side and at the end had fallen. It was good enough for a picture, for this standing cane had made excellent growth,

far ahead of that in the checks. Five rows away on one side was cane treated with arsenic at the rate of 100 lb., which was somewhat fallen; and the plot with 80 lb. of arsenic, on the other side, was not quite as good. Sixty lb. of arsenic showed some value, though the cane in the checks had not fallen so badly in that part of the field and the results were not so apparent. The plots treated with 40 lb. of the poison hardly show any results so far. The injury has not developed far enough in our Badila field for results upon the appearance of the cane. Digging, however, showed that there were fully 50 per cent. less grubs in the treated plots than in the checks, and, furthermore, the grubs were not so far developed. We found about 73 per cent. of the grubs in the checks had reached the third stage, while practically none had gotten to that stage where the heavier doses of arsenic had been applied. It will probably be interesting to have the following exact figures of the number of grubs that we found during our examinations:—

24th February, 1921—

Field D. 1135, check, 3 Stage I., 29 Stage II., and 13 Stage III., or a total of 45.

Plot treated with 200 lb. arsenic, 1 Stage I., 4 Stage II., or a total of 5; and 4 dead second-stage grubs were found, that had just succumbed to the poison.

The next check plot had 2 Stage I., 12 Stage II., and 4 Stage III., or a total of 18.

A stool in a plot treated with 100 lb. arsenic gave 1 Stage I., 8 Stage II., or a total of 9; and one dead of arsenic.

The plot treated with 80 lb. gave 2 Stage I., 4 Stage II., and 1 Stage III., or a total of 7; and 1 dead of arsenic.

The check gave 2 Stage I., 6 Stage II., and 10 Stage III., or a total of 18.

A plot treated with 60 lb. of the poison gave 1 Stage I., 6 Stage II., and 1 Stage III.

Where 40 lb. of arsenic had been applied we found 6 Stage II., and 4 Stage III., or a total of 10 grubs.

From the above figures it would appear that most of the grubs are destroyed by the poison during the second stage, just before they reach the very destructive period in their development. The dead grubs only last a few days in the soil before disintegrating, which accounts for finding so few dead in the soil.

It is too soon to offer conclusive remarks on how much arsenic is necessary for complete control of this pest, or which method of application is best; nevertheless, the results are encouraging.

WHITE GRUBS DESTRUCTIVE TO GRASS PADDOCKS AT ATHERTON.

A species which resembles very closely our cane grubs has been doing rather serious damage to grass lands in the vicinity of Atherton. Mr. Dodd recently did some investigating in this district, and found the grubs very near the surface, where they were destroying the roots of the grass, but fortunately in rather localised areas. I have been able to secure specimens of the beetles of this species through the kindness of Mr. Wilson, of the Babinda Mill staff, who was on the Tableland during their flight, and was thoughtful in securing specimens for us.

These beetles are different from anything that we have in our collections, so are evidently a localised species. It may be remarked, however, that this is a pest which might easily become very important, especially on crops like corn, if not repressed in some way.

TO PICKLE CHILLIES.

Take large, green capsicums, and slit them sufficiently to remove the seeds. Then make a brine of salt and water of sufficient density to float an egg. Place the chillies in this when the brine is cold, and let them remain there for twenty-four hours. Then drain again, rinsing in cold water. Then place in wide-mouthed stone or glass jars. Now take vinegar and water in the proportion of one quart of vinegar and one quart of water to every thirty chillies. Heat to boiling point and pour it over the peppers in the jars. Leave it to stand till cold; then drain off the vinegar and water and throw it away. Now heat fresh vinegar without water and pour it over the peppers boiling hot. Cover the jars tightly and set in a cool place.

General Notes.

SOIL ALKALI: ITS ORIGIN, NATURE, AND TREATMENT.

By F. S. HARRIS, Ph.D., Director and Agronomist of the Utah Agricultural Experiment Station.

One of the most serious problems confronting the farmer of arid and semi-arid regions, more particularly in those where irrigation is practised, is the prevention of accumulation of soluble salts in the soil, which in excessive amounts act as plant poisons. The name ''Soil alkali'' is not restricted to substances having strong basic reaction, but is popularly used for the designation of all soluble salts in the soil which may be injurious to plant life.

A very large amount of literature has been published during the past years on the question of ''Soil alkali,'' but the author is the first to condense this work in text-book form.

The origin of alkali, the nature of injury to plants and seeds, toxic limits, native vegetation indicative of alkali, chemical method of determination of alkali, relation of alkali to physical and biological condition of soil, methods of reclaiming alkali lands, crops suitable for such lands, drainage, alkali irrigation water, &c., &c., are dealt with in the many chapters, the author utilising the numerous fundamental facts collected in all parts of the world, giving the references at the end of each chapter.

His own personal experiences in the treatment of alkali lands make the work particularly valuable to anyone interested in this problem, which affects Australia as much as any other part of the world.

IMPORTANCE OF LIME FOR THE SOIL.

When a soil is found to be deficient in carbonate of lime the remedy is simple. So common is the want of lime that the recommendation to apply it is the most obvious remedy which occurs to any practical agriculturist or agricultural chemist. If a soil is sour; if it is newly broken up from pasture or waste; if it has been reclaimed from a boggy condition; if it is worn out by exhaustive cropping; if pastures or meadow land exhibit coarseness of herbage; if land is addicted to ''finger and toe''; if potatoes are rough-skinned or scabby, or if a field produces stunted or diseased herbage, the first suggestion is to lime it.—''Garden and Field.''

SULPHUR AS A FERTILISER.

Of recent years a number of tests and experiments have been carried out in the United States of America in the use of sulphur as a fertiliser for lucerne fields.

From the reports that have come to hand, it is gathered these have been very successful. For instance, in eastern Oregon nearly six times as much alsike clover hay has been secured from paddocks treated with sulphur at the rate of 100 lb. to the acre, as compared with untreated areas. In the same district a single application of 100 lb. sulphur increased the yield of lucerne on an average 1½ tons per acre for four years. Of course, Australian soil and climate conditions are different from those obtaining in America, but it should be worth somebody's while to make a few tests in this country.

THE SUFFOLK HORSE.

The soundness of the Suffolk horse was indicated in the recent report of the Ministry of Agriculture in England on stallions for which licenses were applied.

This point was specially referred to at the meeting of the council of the society. Attention was drawn to the fact that only 5 per cent. of the stallions were rejected as unsound, and only two animals had side-bone. The faith which breeders of Suffolk horses have in the Punch prompted them to accept without demur the proposal of the breeding scheme committee that at the three sales of pedigree Suffolk horses to be held by the society in March, July, and September next every animal except foals must be sold sound. It was agreed that this proposal meant a bold step, but the members of the council unanimously declared they were prepared to take it.—"Queensland Grazier," 17th March.

CANNED FRUIT SHIPMENTS.

To save the fair name of Australia being dragged in the mire by unscrupulous dealers, and to avert any further cause for complaint by oversea purchasers of Australian canned fruits that such were badly packed or arrived in a condition detrimental to the Australian fruit export industry, the Customs Department, South Australia, will, we understand, next fruit season, adopt a system of inspection at factories, and see that consignments for export are properly graded, canned, and cased, and generally are in accord with a standard adopted by the department. All fair minded fruitgrowers, packers, and exporters, who have the welfare of the Australian fruit industry at heart, will (says "Garden and Field") agree that action in the direction indicated is right and proper.

The Queensland Government some time ago took the same action, with the result that the canned pines for export are pronounced to be equal to any packed in other countries.

PRICES OF RUBBER.

Messrs. Leslie and Anderson, in their market report issued on 27th January last, remark that the market for rubber had been dull during that month, with a declining tendency in prices which showed a fall of 2¼d. to 2¾d. per lb. in ribbed smoked sheet which then stood at a discount of 2½d. to 3d. on Crepe. They quoted standard smoked sheet 9¾d. per lb. London stocks then totalled nearly 55,000 tons. "The Planters' Chronicle," Madras (26th February), states that restriction of output was agreed upon during the latter part of the year, to continue to the end of 1921.

QUEENSLAND FELIX.

If the rest of the world only knew what a bright, happy State this is, how glorious our climate, how fertile our fields, and how diversified our products, Queensland would be so packed with home-seekers that there would not be a spot to loaf on. Home-seekers are what we want, and we are glad to welcome them. We don't want lazy adventurers who cannot make a success of life anywhere, but the hard-working farmer with a little capital, the hard-working farm labourer with his strength and his brains for his capital. These are what we want to build up our State, and it is pleasant to know that they are coming to us in increasing numbers.

THE LARGEST STATION IN AUSTRALIA.

In reply to a correspondent from North Queensland, the "Pastoral Review" (Melbourne) writes:—"Notwithstanding what other papers may have published, the area of Victoria River Downs, N.T., is 11,561 square miles, all connected and under the one manager, and made up of ten leases and two permits. The owners of the property have supplied us with the exact figures for each lease, and we hold their signature as to the accuracy of same. The areas of each block are as follows:—Block 2,184, 8,746 miles; block 2,158, 336 miles; block 2,182, 147 miles; block 2,157, 96 miles; block 253 (permit), 83 miles; block 279 (permit), 98 miles; block 2,183, 240 miles; block 2,174, 327 miles; block 2,159, 249 miles; block 2,175, 388 miles; block 2,180, 353 miles; block 2,181 ~~miles,~~ 498 miles. Total, 11,561 square miles."

THE BUTTERMAN.

We've reached another stage of life,
When failing years are born anew;
This lovely year has seen no strife,
And peacefully departs from view.
A sunny summer filled with fruit,
An autumn crowned with golden lore,
A richer year beyond dispute
Than many that have gone before.
Bountiful year, adieu, farewell,
Go home and tell your Father how
We thank Him more than tongue can tell,
And pray Him still, "God speed the plough."
To patrons, readers, far and near,
And dairymaids throughout the lan',
We wish you all a bright New Year,
Most truly yours, "The Butterman."

Answers to Correspondents.

COTTON SEED.

"S.C.," Marwood, Mackay.—

The request for a supply of cotton seed has received attention. Copy of cotton pamphlet has also been forwarded to Mrs. Ditton and yourself.

COBBLER'S WAX.

Some time ago a correspondent asked us how to make "Black Wax." We could get no information on the subject from anyone in the boot trade. We find a recipe in "The Land" for making cobbler's wax, which may possibly have been the material in view:—Melt together ½ lb. white wax, 1 lb. hard soap, 1 oz. ivory black, and a quarter pint of linseed oil. Dissolve over a slow fire, stir until cool, and turn into small moulds.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR APRIL, 1921.

Article.		APRIL. Prices.
Bacon, Wholesale	lb.	1s. 3d. to 1s. 4d.
Bacon, Retail	„	1s. 5d. to 1s. 6d.
Barley	bush.	...
Bran	ton	£9 10s.
Broom Millet	„	£24 to £29
Broom Millet (Sydney)	„	£30 to £40
Butter (First Grade)	cwt.	196s.
Chaff, Mixed	ton	£5 10s. to £7 10s.
Chaff, Oaten	„	£5 to £8
Chaff, Lucerne	„	£6 10s. to £9 5s.
Chaff, Wheaten	„	£5 5s to £7
Cheese	lb.	1s. to 1s. 0½d.
Flour	ton	£19 10s.
Hams, Retail	lb.	1s. 4d. to 1s. 9d.
Hams, Wholesale	„	1s. 3d. to 1s. 4d.
Hay, Lucerne	ton	£6 to £7
Hay, Oaten	„	...
Honey	lb.	4d. to 4¾d
Maize	bush.	4s. 4d. to 4s. 5d.
Oats	„	3s. 6d.
Onions	ton	£4 to £8
Peanuts	lb.	3d. to 6d.
Pollard	ton	£10
Potatoes	„	£6 to £9 5s.
Potatoes (Sweet)	cwt.	2s. to 4s.
Pumpkins (Cattle)	ton	£3 to £4 10s.
Eggs	doz.	2s. 1d. to 3s. 1d.
Fowls	per pair	4s. to 7s.
Ducks, English	„	4s. to 6s. 6d.
Ducks, Muscovy	„	5s. to 7s. 6d.
Geese	„	10s. to 12s.
Turkeys (Hens)	„	9s. to 10s.
Turkeys (Gobblers)	„	17s. to 21s.
Wheat	bush.	5s. 7d. to 6s. 6d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans, per sugar bag	4s. to 8s. 6d.
Beetroot, per dozen bunches	1s. to 1s. 7d.
Cabbages, per dozen	4s. to 13s. 6d.
Carrots, per dozen bunches	1s. to 1s. 6d.
Chocos, per quarter case	1s. 6d. to 3s. 6d.
Cucumbers, per dozen	1s. to 1s. 6d.
Lettuce, per dozen	6d. to 1s.
Marrows, per dozen	1s. 3d. to 4s.
Parsnips, per dozen bunches	...
Peas, per sugar bag	1s. 5d. to 13s.
Potatoes (Sweet), per sugar bag	2s. to 4s.
Pumpkins (table), per ton	£4 15s. to £4 17s. 6d.
Rhubarb, per dozen bunches	9d. to 2s. 3d.
Tomatoes, per half-bushel case	3s. to 6s. 9d.
Turnips (Swede), per dozen	4d. to 6d.

SOUTHERN FRUIT MARKETS.

Article.	APRIL. Prices.
Bananas (Tweed River), per double case	13s. to 16s.
Lemons, per bushel case	7s. to 15s.
Pineapples (Queens), per double case	10s. to 15s.
Pineapples (Ripleys), per double case	5s. to 7s.
Pineapples (Common), per double case	5s. to 7s.
Oranges, (Queensland), per case	20s. to 25s.
Oranges (Other), per case	3s. to 10s.
Tomatoes, per half bushel case	2s. to 3s.
Passion Fruit, per half bushel case	8s. to 18s.
Peaches per bushel case	2s. 6d. to 7s.
Pears, per bushel case	5s. to 10s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, (Imported), per bushel case	5s. to 15s.
Apples, Cooking, (Imported), per bushel case	7s. to 11s.
Bananas (Cavendish), per dozen	3½d. to 8d.
Bananas (Sugar), per dozen	3d. to 9d.
Citrons, per cwt.	8s. to 9s.
Cocoanuts, per sack	£5
Grapes, per case	7s. to 9s.
Lemons (Lisbon), per half bushel case	3s. 6d. to 7s. 6d.
Persimmons, per half bushel case	5s. to 9s.
Rockmelon, each	6d. to 1s.
Oranges, per bushel case	5s. to 11s.
Oranges (Seville), per cwt.	13s.
Pineapples (Smooth), per dozen	1s. 4d. to 7s. 6d.
Pineapples (Rough), per dozen	7s. 3d.
Pears, per bushel case	10s. to 15s.
Papaw Apples, per tray	3s. 5d. to 7s. 6d.
Peaches	1s. 6d. to 4s. 6d.
Plums	5s. 6d. to 8s.
Quinces, per case	6s. to 8s.
Mandarins, per bushel case	16s.
Custard Apples, per tray	5s. to 7s.

TOP PRICES, ENOGGERA YARDS, MARCH, 1921.

Animal.	MARCH. Prices.
Bullocks	£16 5s. to £17 7s. 6d.
Bullocks (Single)	...
Cows	£10 5s. to £13 17s. 6d.
Merino Wethers	34s. 6d.
Crossbred Wethers	40s.
Merino Ewes	25s. 3d.
Crossbred Ewes	32s. 9d.
Lambs	35s. 3d.
Pigs (Backfatters)	...
Pigs (Bacon)	...
Pigs (Porkers)	67s.

Farm and Garden Notes for June.

FIELD.—Winter begins on the 24th of this month, and frosts will already have been experienced in some of the more exposed districts of the Southern coast and on the Darling Downs. Hence, insect pests will, to a great extent, cease from troubling, and weeds will also be no serious drawback to cultivation. The month of June is considered by the most successful lucerne-growers to be the best time to lay down this crop, as any weeds which may spring up in the event of a dropping season will be so slow-growing that the young lucerne plants will not be choked by them.

The land should now be got ready for millets, sorghums, panicum, &c. Oats, barley, vetches, clover, tobacco, buckwheat, field carrots, and Swedes may now be sown. Some advocate the sowing of early maize and potatoes during this month, but, obviously, this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern districts and on the tableland neither maize nor potatoes should be planted before August, or at the earliest, in warm, early districts, at the end of July. There is always almost a certainty of frosts, more or less severe, during these months. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn or in the open, if the weather be fine. In pitting them or storing them in hills lay them on a thick layer of sand, then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process until the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Late wheat may still be sown, but it is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas, Fibre may be produced from the old stems. A hand machine for this purpose was once introduced into Queensland from France, which would turn out 65 lb. of clean fibre in a day of ten hours; but it proved to be unworkable.

KITCHEN GARDEN.—Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted, also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of

plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes, the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 in., and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days, thin out so as to leave each plant (if in the border) at least 4 to 6 in. apart.

Orchard Notes for June.

THE SOUTHERN COAST DISTRICTS.

The Notes of last month, referring to the care to be taken in the handling and marketing of all kinds of citrus fruits, apply with equal force during this and subsequent months till the end of the season.

Keep the orchard clean, and work the land to retain moisture. The handling of the citrus crop is the main work in many orchards, but where slowly acting manures are to be given their application should not be later than this month. They should be well mixed with the soil, so that when the spring comes and the trees start a fresh growth a certain percentage of plant food will be available for the trees' use. Heavy pruning should be done now, whilst the trees are dormant. All large limbs should be cut off close to the main stem; the edges of the cuts should be carefully trimmed, and the whole wound, if of large size, covered with paint or grafting wax, so that it will not start to decay but soon grow over. When the soil of the orchard is becoming deficient in organic matter, the growing of a Winter green crop, such as mustard or rape, is well worth a trial. Clear the crop of fruit from the part of the orchard to be so treated. Plough the land well; work the soil down fine so as to get a good seed bed, and broadcast the mustard or rape. A manuring of 4 cwt. of meatworks manure and 1 cwt. of sulphate of potash per acre will produce a very heavy crop of green manure, and the plant food not required for the production of such crop will be still available for the trees' use in Spring.

Pineapples and bananas should all be cleaned up, and the land got into first-class order. Pineapples, where at all liable to frost, should be covered with grass or other suitable material. The growth of weeds between the rows of pines on land liable to frost is one of the best ways of encouraging frosts, as frost will strike dirty, weedy ground, and severely injure the pines growing thereon, when it will do little, if any, damage where the land is kept perfectly clean—another advantage of cleanliness in cultivation.

THE TROPICAL COAST DISTRICTS.

Keep the land well cultivated—plough when necessary to bury weed growth, and get the surface of the ground into a state of thorough tilth, as moisture must be retained in the soil by cultivation to mature the Spring crop of fruit. This applies not only to oranges and other tree fruits, but to bananas and pines as well. A good start in Spring means good bunches of bananas and early-ripening pineapples. Heavy pruning can be done now in the case of all trees not carrying a heavy crop of fruit; but where citrus trees are heavily loaded, the pruning should be put off till after the Spring crop of fruit has been gathered. The spraying of the trunks and inside of the trees with the lime and sulphur wash can be carried out, and where Maori is making its appearance the sulphide of soda wash should be used as well.

THE SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all kinds of deciduous fruit trees is the chief work of the month in the Stanthorpe district. Do not be frightened to prune severely—first, in the case of young trees, so as to get strong well-grown trees instead of straggling top-heavy trees; and, second, in the case of trees that are going off in the size and quality of their fruit. Where peaches, apricots, plums, or nectarines are only making very little growth and that weak, so that the fruit produced thereon is small, it is advsable to head the tree hard back, so that it will throw out some vigorous branches in Spring that will form a new head for the tree. Apples, as well as plums and apricots, are sometimes inclined to over-produce fruit spurs, which become long and straggling, and bear a large quantity of small-sized fruit. A vigorous shortening back and cutting out of such spurs will have a very beneficial effect in the quality and size of the fruit produced.

Gather and burn all prunings; and where codlin moth is present in the orchard, examine the tree carefully when pruning it, so as to see if there are any cracks, crevices, or masses of loose bark, in or under which the larvæ of the moth may be hibernating. All larvæ so found should be destroyed, and if the work is carried out systematically it will tend to materially decrease the crop of moths that will hatch out the following Spring.

As soon as any part of the orchard is pruned, gather up the prunings and work the land, as a thorough winter weathering of the soil is very beneficial in its effects; and, further, it will tend to destroy many insects that may be wintering in it. The planting of new orchards or of trees to replace any that may have died, or that have been proved to be unsuitable to the district, may be continued during the month, and right on till the end of Winter.

Do not prune vines in the Stanthorpe district, as it is advisable to leave the pruning as late as possible, but vine-pruning can be done at any time now in the Roma or Central districts. Tree-pruning can be continued during the month, and the orchard should be kept well worked. Citrus fruits can be marketed. Lemons should be gathered and cured.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6·26	5·21
8	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5·6	6·24	5·23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·21	5·24
14	6·20	5·7	6·36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·0	6·38	5·9	6·19	5·25
16	6·22	5·6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6·37	5·0	6·37	5·10	6·17	5·26
18	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
19	6·23	5·4	6·37	5·0	6·36	5·11	6·15	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·14	5·28
21	6·24	5·3	6·38	5·1	6·36	5·12	6·14	5·28
22	6·25	5·3	6·38	5·1	6·35	5·13	6·13	5·28
23	6·26	5·3	6·38	5·1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·38	5·1	6·35	5·14	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·29
26	6·28	5·2	6·39	5·2	6·34	5·15	6·9	5·30
27	6·28	5·1	6·39	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·39	5·2	6·33	5·16	6·7	5·31
29	6·29	5·1	6·39	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6·32	5·17	6·5	5·32
31	6·31	5·0	6·39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H. M.
8 May.	●	New Moon	7 2 a.m.
15 „	☾	First Quarter	1 25 a.m.
22 „	○	Full Moon	6 15 a.m.
30 „	☽	Last Quarter	7 45 a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

6 June	●	New Moon	4 14 p.m.
13 „	☾	First Quarter	7 0 a.m.
20 „	○	Full Moon	7 41 p.m.
28 „	☽	Last Quarter	11 17 p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

5 July	●	New Moon	11 36 p.m.
12 „	☾	First Quarter	2 16 p.m.
20 „	○	Full Moon	10 8 a.m.
28 „	☽	Last Quarter	12 20 p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

4 Aug.	●	New Moon	6 17 a.m.
11 „	☾	First Quarter	12 14 a.m.
19 „	○	Full Moon	1 28 a.m.
26 „	☽	Last Quarter	10 51 p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Queensland.

Department of Agriculture and Stock.

Volume XV. JUNE, 1921.

Queensland Agricultural Journal.

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Edited by
J. F. F. REID.

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THE

Queensland Agricultural Journal,

ISSUED BY DIRECTION OF

THE HON. THE SECRETARY FOR AGRICULTURE.

Edited by J. F. F. REID.

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CONTENTS.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XV. JUNE, 1921. PART 6.

EDITORIAL CHANGE.

In this issue we take official farewell of Major A. J. Boyd, F.R.G.S.Q., who has retired from the control of this Journal, under the provisions of the Public Service Act. Major Boyd has been associated with "The Queensland Agricultural Journal" as editor since its first issue in July, 1897, and in the course of the time that has since elapsed he became the friend of practically every farmer in the State. The Journal is his monument. By general consensus of opinion in literary and agricultural circles the publication, under his direction, attained a high standard, and became a credit to the Department and the State. Since his retirement Major Boyd has been the recipient of appreciative notices of his great work in the cause of agricultural education from all parts of the Commonwealth. He carries with him into unofficial life the good wishes of all his old departmental colleagues and of all connected with Queensland rural interests which, for a quarter of a century, he served so ably. Mr. J. F. F. Reid, who succeeds Major Boyd, has had many years' practical agricultural, pastoral, and journalistic experience in Queensland. He served in the ranks and as an officer of the A.I.F., and, after the armistice, spent over twelve months in the study of various phases of rural industry on the Continent of Europe and in the United Kingdom.

MAJOR A. J. BOYD, F.R.G.S.Q., LATE EDITOR.

HIS SUCCESSOR, MR. J. F. F. REID.

PLATE 26.

Agriculture.

DIGESTIBILITY OF FODDER.

BY J. C. BRUNNICH and V. S. RAWSON.

[Read before the Hobart-Melbourne meeting of the Australasian Association for the Advancement of Science.]

(Continued from May Journal.)

BRAN.

——	Organic Matter.	Crude Protein.	Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	84·29	14·26	4·48	55·71	9·84	12·85	..
Digestible	62·04	11·42	2·67	44·34	3·61	10·01	48·86
Digestible Co-efficient	73·6	80·1	59·7	79·6	37·0	77·8	..
HENRY—WINTER BRAN.							
Analysis	83·1	15·7	4·4	54·2	8·8	..	..
Co-efficient	67·0	78·0	65·0	71·0	28·0	..	..
HENRY—SPRING BRAN.							
Analysis	84·3	15·7	4·8	52·6	10·2	..	..
Co-efficient	69·0	76·0	62·0	74·0	43·0	..	..
KELLNER.							
Co-efficient	69·0	79·0	71·0	71	26·0	..	..

The digestibility of the bran does not show any great difference from the American or German figures for the digestibility co-efficients, but there is one point which is worthy of some consideration for further investigation. It will be noticed that the digestibility of fat in both pollard and bran is low compared with other standards, whilst that of fibre is higher; also in other products this constituent is more digestible. On comparing the figures of Henry for the digestibility of these two factors in winter bran and spring bran the digestibility of fat in the latter is lower, whilst of the fibre it is considerably higher. Owing to its period of growth the bran produced from the Australian wheat would be expected to resemble more closely the bran produced from spring wheat than from winter wheat, and this appears to be the case from our results of digestibility. Though the digestibility of the protein is fairly high in the sample analysed, it is worthy of note that that of the spring wheat is lower than that of the winter, and, as will be noticed, there are several cases of low digestibility in the samples here analysed. Likewise with the hay the growth is more rapid and hence probably the fibre is more digestible; this might also account for the low digestibility of the protein.

Before leaving the question of bran and pollard, it must be remembered there are a very large number of varieties of wheats in Australia, and it does not necessarily follow that the by-products from a strong and weak wheat would have the same co-efficient of digestibility. A further point worthy of note in comparing these two products is that both give approximately the same amount of digestible constituents, but the work exerted in mastication and digestion of the pollard is practically negligible, whilst in the case of bran, according to Kellner, 33 per cent. of the total starch value is employed therein, and thus we obtain a net starch value for bran considerably below that of pollard.

MAIZE MEAL.

——	Organic Matter.	Crude Protein.	Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	85·28	8·57	3·65	71·03	2·03	8·05	..
Digestible	69·20	5·13	3·07	59·88	1·12	4·61	..
Digestible co-efficient	81·10	59·9	84·1	84·3	55·1	57·4	71·84
		(I) AFTER HENRY (12 SAMPLES).					
Digestible co-efficient	..	74·0	93·0	94·0	57·0	..	..
		(II) AFTER JORDAN (5 SAMPLES).					
Digestible co-efficient	89·6	67·9	92·1	94·6	..	..	..
		(III) AFTER KELLNER (AVERAGE).					
Digestible co-efficient	90·0	72·0	89·0	95·0	58·0	..	..
		(IV) AFTER KELLNER (MINIMUM).					
Digestible co-efficient	83·0	58·0	81·0	87·0	46·0	..	..

Except in the digestibility of the fibre, the digestibility of our maize is much poorer than that of the averages of maizes from Germany and America. It is of interest to note, however, that there is considerable difference in the two averages mentioned from America; further, it should be mentioned that in twenty-three investigations by Kellner, the digestibility of the protein varied from 58 to 84 per cent. The lowest figures given by Kellner are very similar to those obtained by us, and it would be unfair to assume that all maizes grown in Australia show such a low percentage of digestibility as compared with those from other countries.

ENSILAGE.

The sample of ensilage which was obtained for this experiment was made at the Yeerongpilly Experimental Station, and consisted of a mixture of maize and millet. To obtain accurate results, samples were taken each day, from the quantity fed, for analysis, and the experiment was successfully carried out in triplicate, in two cases with bran and hay and in the third lucerne and hay. The results agreed very closely in the two mixtures.

——	Organic Matter.	Crude Protein.	Crude Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	27·90	1·44	·59	16·10	9·77	1·20	..
Digestible	16·83	·33	·36	10·18	5·96	·09	..
Digestible co-efficient	60·1	22·9	60·9	63·2	61·00	7·5	12·53
		KELLNER—MAIZE ENSILAGE.					
Digestible co-efficient (average)	67	51	80	67	71	..	..
Digestible co-efficient (minimum)	57	22	65	55	56	..	..

Comparing this silage with those from American averages, the results seem to show that the protein digestibility is very inferior. It is also much lower than those given for maize ensilage by Kellner, though the lowest of thirteen different sorts of this silage gave results very similar to the one analysed in Queensland. The same remarks apply here as in the case of maize meal. It is generally known that in the making of ensilage much of the protein is converted into the less complex nitrogenous bodies as amides and amines, which have not the same value as foodstuffs. There is no doubt that the system of ensilaging is a good manner of conserving fodder, though at the same time there is considerable loss. Dr. E. J. Russell, F.R.S., now Director of Rothamsted, about twelve years ago showed by experiment at the South-Eastern Agricultural College that there was a loss, chiefly of protein and nitrogen free extract, of from 30 to 40 per cent. of the dry matter in ensilage, though in America this has been brought down to about 20 per cent. In a country such as Australia, if properly carried, the making of ensilage should be of great value, but much investigation is needed as to the best manner in so doing, and it is of importance to make systematic analyses of both total and digestible nutrients of such fodder. It would be of value even to carry out an investigation as to its digestibility on those State Farms throughout Australia where ensilage is made, and to compare results.

COARSE DRIED BLOOD.

——	Organic Matter.	Crude Protein.	Crude Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	82·98	78·75	1·88	2·35	..	77·96	..
Digestible	52·11	47·88	1·88	2·35	..	47·09	..
Co-efficient	62·80	60·8	100	100	..	60·4	50·6
AFTER KELLNER.							
Digestible co-efficient	63·0	62·0	100	100	..	..	..

This sample of blood meal was hard and coarsely ground. During the time of the experiment it was suggested that a specially prepared finely ground blood meal now on the market should be much more digestible, and a further experiment was carried out with this blood, at the same time feeding the same basal ration of pollard, lucerne, and hay with the coarsely ground blood to two other sheep as control. Although the figures for nitrogen free extract and fat cannot be relied upon, the duplicate analyses compared fairly well, and the fact was brought out that though the fine sample was distinctly lower in protein matter, more especially true protein, the amount of digestible true protein and organic matter was very much greater.

FINE BLOOD MEAL.

——	Organic Matter.	Crude Protein.	Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	80·77	71·40	3·39	5·98	..	68·69	..
Digestible	71·33	63·55	3·05	4·54	..	60·84	68·19
Digestible co-efficient	88	89·0	89·9	75·9	..	88·6	..

It will be seen from these figures that both crude and true protein are nearly 50 per cent. more digestible in the case of the fine blood meal than in coarse blood, and whereas the total true protein is 9 per cent. lower in the fine sample, the digestible co-efficient of the true protein is 29 per cent. higher, thus showing the importance of testing the digestibility of foodstuffs to supplement the ordinary analysis.

MITCHELL GRASS HAY.

This sample of hay, which was secured from the north-west of Queensland, gave very unsatisfactory results both as to analysis and digestibility.

——	Organic Matter.	Crude Protein.	Fat.	N.F.E.	Fibre.	True Protein.	Starch Equivalent.
Analysis	76·86	3·63	1·04	29·74	42·45	3·50	..
Digestible	26·47	·63	·41	9·75	25·68	·50	..
Digestible co-efficient	47·5	17·5	39·60	32·80	60·5	14·4	13·75
Digestible co-efficient of hay in hay and 20 per cent. lucerne	42·2	14·8	41·4	32·6	51·4	..	..

On comparing this sample of Mitchell hay with that of the poor bush hay, it will be seen that the analysis is of a very similar nature, except that the protein and fibre are higher and the carbohydrates less. The digestible co-efficients are also very similar, though the carbohydrates here are considerably less. This may be accounted for in that the sample of hay was three years old. The hay was fed alone and also with lucerne hay. In the latter case the digestible co-efficients were considerably less, and the figures given are those of the hay fed alone. Whether the lower figures in the case of the hay fed with lucerne were due to the influence of the lucerne, or owing to using a new bag*, though from the same lot of hay previously used, it is

* This does not appear probable as ensilage, which was fed with bran in the one case and with lucerne in the other, gave approximately identical co-efficients of digestibility.

too difficult to say, but the interesting point is that in experiments carried out in North Carolina some years ago the same diminution was found in the digestibility of old Timothy hay in feeding with a more concentrated food. In the three cases of the two hays and the ensilage, it must be borne in mind that the digestibility as before stated is the apparent digestibility only, and the lower the protein percentage in the fodder the greater is the error brought about by extra nitrogenous compounds in the excreta. The low starch value of this sample is partly brought about by the reduction necessary on account of the high amount of fibre.

In conclusion, two things are brought out by these experiments which are of considerable value, and these are that, whilst the digestibility of the protein and fat is somewhat lower in Australian fodders than those from America and Germany, that of the fibre is distinctly higher, and, as indicated in the discussion of the bran, this is probably due to the more quickly growing nature of the plants in this country. In connection with the lower digestibility of the proteins, especially in the roughages, it is of interest that, according to figures taken from "Sheep and Wool," by A. Hawkesworth, the nitrogen contents of wool is about 2 per cent. lower in Australian than in English wool. In the feeding of animals there are many points to elucidate before we arrive at any definite conclusions. In Europe and America special institutes for research work on animal nutrition are to be found, and as yet there is not a single institute devoted to this work in Australia. There can be no doubt that such work is of prime importance to a country with such different conditions of climate and soil, and where agriculture is one, if not the greatest, mainstay of the people, and it is to be hoped that under the new Institute of Science and Industry these questions will hold a prominent position for the sake of the agriculturists in Australia.

APPENDIX.

Data from Experiment with Hay and Lucerne.

Amount of food eaten by sheep—Lucerne, 3,336 grams; hay, 5,368 grams.

	Analysis of Lucerne.	Analysis of Hay.
Moisture	10·06	16·31
Crude protein	15·95	2·95
Crude fat	1·40	·77
N.F.E.	38·21	39·94
Fibre	25·40	34·55
Ash	8·98	5·48
Insol. ash	·76	3·64
True protein	12·36	2·63

AMOUNT OF FÆCES OBTAINED FROM SHEEP.

Wet fæces	6,250 grams.
Dry fæces	3,270 grams.
Percentage of moisture	47·7

ANALYSES OF FÆCES.

	Dry. Per cent.	Wet. Per cent.
Moisture	8·18	51·98
Crude protein	7·53	3·94
Crude fat	1·61	·84
Nitrogen extract	41·12	21·51
Crude fibre	30·44	15·92
Ash	11·12	5·81
Insoluble ash	6·30	

AMOUNT OF MATERIAL IN FODDER.

——	Organic Matter.	Crude Protein.	Crude Fat.	N.F.E.	Fibre.	True Protein.
3,336 grams lucerne	2,700·5	532·1	46·7	1,274·4	847·3	412·3
5,368 grams hay	4,198·3	158·3	41·3	2,144·0	1,854·6	141·2
Total	6,898·8	690·4	88·0	3,418·4	2,701·9	583·5

AMOUNT OF MATERIAL IN FÆCES.

Total	2,639·0	246·0	52·6	1,334·0	995	..
Calculated from lucerne	770·0	114·0	24·9	340·0	296	..
Calculated from hay	1,869·0	132·0	27·7	994·0	699	..
Amount of hay digested	2,329·3	26·3	13·6	1,150·0	1,155·6	9·2
Percentage digested	55·5	16·6	33·0	53·7	62·6	6·5

Duplicate Testing of Digestibility of Hay.

Amount of food eaten—Lucerne, 2,290 grams ; hay, 4,486 grams.

AMOUNT OF FÆCES OBTAINED FROM SHEEP.

Wet fæces	6,150 grams
Dry fæces	2,590 grams.
Percentage of moisture ..	57·9

ANALYSES OF FÆCES.

	Dry.	Wet.
Moisture	7·74 ..	61·16
Crude protein	7·08 ..	2·98
Crude fat	1·57 ..	·66
Nitrogen free extract	42·14 ..	17·74
Crude fibre	30·40 ..	12·80
Ash	11·07 ..	4·66

AMOUNT OF MATERIAL IN FODDER.

——	Organic Matter.	Crude Protein.	Crude Fat.	N.F.E.	Fibre.	True Protein.
2,290 grams lucerne	1,854·0	365·3	32·4	875·0	581·7	283·0
4,486 grams hay	3,508·4	132·3	35·5	1,792·5	1,550·0	118·1
Total	5,362·4	497·6	67·9	2,667·5	2,131·7	401·1

AMOUNT OF MATERIAL IN FÆCES.

Total	2,103·0	183·0	40·6	1,092·0	787·5	..
Calculated from lucerne	529·0	71·0	17·2	235·0	203·5	..
From hay	1,574·0	112·0	23·4	857·0	584·0	..
Amount of hay digested	1,934·4	20·3	12·1	935·5	966·0	6·1
Percentage hay digested	55·2	15·3	34·1	52·2	62·3	5·2

The Chemical Laboratory,
Department of Agriculture and Stock,
Brisbane.

WINTER SCHOOL FOR FARMERS, 1921.

The Winter School Course embraces a variety of subjects, the whole of which it is impossible for one student to take up; but students are expected to select such branches of training as may be best suited to the conditions of their own districts and farms. The Course of Instruction will be continued for three weeks from 13th June to 2nd July, 1921. Farmers and graziers, or their sons over 18 years of age, who have worked at least one year on the land, are eligible for admission. Application for entrance must be forwarded to the Principal of the College not later than the 1st June.

A fee of £3 3s. is charged for the course. This covers board, lodging, and tuition at the College. The fee is payable in advance. All students are to be subject to the regulations in force at the College. Each student must provide himself with towels, blankets, sheets, pillow-cases, soap, and other personal requisites, and students are advised to bring suitable warm clothing. The College Reference and Circulating Library and the Reading-rooms are made available for students. The Gymnasium and Recreation Grounds are well equipped and can be used by students. Laundry work can be arranged for, but must be paid for in cash.

The course will include lectures and demonstrations on the following subjects:—Principles of Stock Breeding; Feeds and Feeding; Farm Economics; Elementary Veterinary Work; Forage Crops and Conservation of Fodder—Silage and Silage Making; Pastures and Pasturage; Soils and Soil Fertility; Seed Selection and Seed Testing; Milk and Cream Testing—Herd Testing; Butter and Cheese—Cream Grading; Bacteriology in Relation to the Farm; Wool Classing—Sheep; Poultry Farming; Pig Farming—Bacon Curing; Elementary Bookkeeping; Orcharding.

All students will be expected to attend lectures in the first five subjects, and each intending student should indicate in his application which of the remainder he desires to take up.

In addition to the above, practical tuition will be provided in Carpentry, Blacksmithing, Saddlery, and Engine-driving. Further, each section of the farm will be open daily for inspection and observation of the general routine practised.

CONFERENCE OF MINISTERS OF AGRICULTURE.

An Interstate Conference of Ministers of Agriculture was held at Adelaide in the course of the month. The Hon. W. N. Gillies, accompanied by Messrs. E. G. Scriven (Under Secretary, Department of Agriculture and Stock) and E. Graham (State Dairy Expert) represented Queensland.

The conference affirmed its belief in bulk handling of wheat, and of the States as far as possible arriving at uniformity in regard to the disposal of primary products generally. Other affirmations favoured—

The establishment of Dairy Advisory Committees in each State, and the appointment of an Interstate Committee to co-operate with the State Committees.

The facilitation of stock exchanges from State to State without surrendering the rights of a State to protect its own herds.

The uniform raising of horse-breeding standards on the lines of the Victorian and Tasmanian statutes governing same.

Uniformity respecting the official testing of pure bred dairy herds.

Closer supervision over the quality of dairy produce, and the encouragement of greater consumption of dairy products.

The compulsory registration of storage premises for dairy products.

A uniform examination standard for (*a*) milk and cream testers; (*b*) certificates (*c*) interstate reciprocity in regard thereto.

A recommendation to interstate steamship companies to extend their refrigerated accommodation; and to all shipping companies providing refrigerated space, including Commonwealth shipping line, that, as a matter of urgent necessity, a reduction in the cost of freight for refrigerated cargo be made.

Seed Wheat for Disposal.

AT HERMITAGE STATE FARM.

This Department has been experimenting for a number of years with several varieties of wheat as a result of crossbreeding and selection work at Roma State Farm; some have consistently given satisfactory results, very often under adverse conditions. These are now being offered to wheatgrowers, in order that they may have the opportunity of acquiring seed of varieties which have been tested and found suitable to soil and climatic conditions in the wheatgrowing districts of the State.

Orders for the undermentioned varieties (which are illustrated and described elsewhere) should be directed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Remittance must accompany order, and, in the case of cheques, should have exchange added.

The price quoted for any of the varieties offered is 11s. per bushel, f.o.b. Hermitage.

VARIETIES.—"Inglewood," "Patriot," "The Prince," "Gundi."
(*See* accompanying illustration of three of the varieties.)

In addition to the above a limited quantity of "Amby" is also available at the same price.

Inglewood.—Mid-season variety. This is derived from a cross between Bunge and Federation Wheat, and has given consistent results in the South-Western wheat areas. The plant is of medium height, and on strong soils is inclined to carry a fair amount of flag. It stools well and possesses a straw of medium strength. Heads are of medium length, slightly tapering; non-bearded. The chaff is smooth and light-brown in colour. Grain of medium size, somewhat elongated in appearance; semi-translucent.

Patriot.—Derived from a selection made after crossing Bunge and a Durum wheat. A mid-season variety, of moderate stooling habit. Straw is of medium height and somewhat tough. Flag scanty. Head tapering, non-bearded, open appearance, and of medium length. Chaff smooth and of a pale-golden colour. Grain somewhat short; full-bosomed; semi-translucent.

"Inglewood." "Patriot." "The Prince."

PLATE 27.—SEED WHEAT FOR DISPOSAL.

The Prince.—A selected crossbred wheat; early mid-season variety, of fairly tall-growing habit, suitable for main-crop sowing. A good stooler, and carries very little flag. Head of medium length, open appearance, slightly tapering; non-bearded. Chaff smooth and of a pale-golden colour and somewhat closely attached to the grain, which is plump, full-bosomed, semi-translucent, and of medium hardness. Fairly resistant to rust.

Gundi.—A selection from a Bunge-Federation cross. A mid-season variety suitable for early sowing, of moderate stooling habit. It carries a medium amount of flag. Straw moderately stout and slightly under medium height. Head long and compact. Chaff smooth and light-brown in colour. Grain medium-sized; somewhat rough skinned; white in colour. This variety has given a yield of 37.2 bushels at Roma State Farm. More suited for Western and South-Western conditions than for the Downs.

Amby.—A popular variety suitable for main-crop sowing. It is a hardy mid-season variety and a good stooler, carrying a moderate amount of flag. Ears compact, non-bearded; chaff white and smooth. Grain plump and rather shotty in appearance; semi-translucent. Is an excellent milling wheat and has given good results in the principal wheat-growing districts.

AT STATE FARM, ROMA.

The following varieties of Seed Wheat are available for distribution from Roma State Farm. Price 11s. per bushel; free on trucks, Bungeworgorai:—

"Amby." **"Bunge No. 1."** **"Soutter's Early."**

Limited quantities of the following new wheats are also available at the same price:—

"Cedric." **"Inglewood."**

In the event of farmers desiring to have small quantities not exceeding 1 bushel of new varieties of Roma Crossbreds for trial this season, arrangements for their purchase may be made with the Manager at the same rate—*i.e.*, 11s. per bushel, free on trucks, Bungeworgorai.

Remittance, with exchange added, should accompany order, and be sent direct to the Manager, State Farm.

Pastoral.

THE SHEEP MAGGOT FLY PROBLEM IN QUEENSLAND.

By PROFESSOR T. HARVEY JOHNSTON, University, Brisbane.

The sheep maggot fly problem in Australia, as well as in New Zealand, South Africa, Great Britain, and elsewhere, has no doubt been brought about by some disturbance of natural conditions. Blowflies normally deposit eggs or larvæ in carrion, but for some reason several of our native Australian species have adopted the habit of "blowing" living sheep. Apparently the soiled wool on the crutch gives off certain odours which have an attractive influence on the gravid female flies, leading them to deposit their offspring in the position indicated. It is quite possible that one or more kinds of flies initiates the attack and sets up such a condition as leads to infestation by other blowflies. Associated with this "myiasis" there is an alteration of the animal's health—partly from the irritation caused by the presence of the maggots, partly from the destruction of tissues and the invasion by germs of various kinds—a more or less pronounced fevered state being observable. Not infrequently death is the result. At times, even a mild invasion by maggots is very rapidly followed by the death of the animal, such being probably due to septicæmia or blood poisoning.

It has been estimated that the annual loss of sheep, due to natural causes (old age, lambing, disease, and accidents) is about 5 per cent., and that the losses as a result of fly attack in Queensland also average about 5 per cent. If these figures be approximately correct, then one can realise quite readily what an enormous loss is being inflicted annually on one of our great primary industries. It is a serious mistake to imagine that the pastoralist is the only person affected. A diminution of the wool yield must adversely affect the shearer, carrier, and others in the country dependent on the wool industry. State and Commonwealth returns from both land and income taxation, also Crown rents and railway receipts, must become reduced. Shipping interests suffer, and so also do city life and business. The matter is then not merely one affecting only a section of the community, but is truly national, particularly in this State and in New South Wales.

The problem can be attacked from two sides, either biologically or chemically, the former being concerned especially with the fly and the latter with the sheep. The application of certain poisonous chemicals—either as dips, jets, sprays, showers, washes, &c.—to sheep will not destroy fly preponderance; the aim being (1) to destroy any maggots already infesting an animal, and (2) to protect it from fly attack. Excellent work along this line of investigation has been carried out at Dalmally by the Queensland Blowfly Committee of the Institute of Science and Industry, ably assisted by Mr. W. A. Russell. A great many medicaments have been tried, but it has been ascertained that only those containing not less than a certain percentage of arsenic are of use. However successful the chemical attack may be, it must be remembered that this method of control must be continued year after year and involves a good deal of expense in regard to equipment and labour especially.

The biological side of the investigation aims at studying the flies and their controlling agents, so that there may be not only less opportunities for flies to breed (by destroying their ordinary breeding places), but also less flies actually developing from the eggs and maggots laid by the adult female fly, this latter result to be brought about by the use of such natural enemies (*e.g.*, certain wasps) as parasitise and destroy them while the flies are still in the maggot or pupal stage. Biological methods, if successful, lead to a reduction of the pest to such a state that a certain balance becomes established between the blowflies and their parasites, whereby the former are controlled. Continued expenditure should then not be necessary, unless for some reason, natural conditions favoured the flies rather than the parasitic wasps and other organisms which live at their expense.

The writer does not claim to possess special knowledge of the problem in the field, but for the past few years a considerable amount of investigation has been carried out under his guidance in the biological laboratory at the University, Brisbane, where the life history of the various flies and the different wasps which infest and destroy them has been studied.

Since practically all the work has been carried out in Brisbane, it is not safe to assume that similar results will necessarily be obtained in the western part of Queensland. A great deal of research has already been carried out in New South

Wales under the superintendence of Mr. W. Froggatt, who, with his colleagues, has also been actively engaged in studying the sheep maggot fly problem, but in order that our local knowledge may be more satisfactory and useful, similar as well as additional investigations should be undertaken in this State, especially in some pastoral centre.

Available evidence seems to incriminate one kind of fly especially as the sheep maggot fly—a medium-sized, bluish green blowfly, usually called *Pycnosoma* (or *Chrysomyia*) *rufifacies*. In other countries the culprit is a somewhat similar fly generally called *Lucilia*. We have in Queensland abundance of this latter copper-coloured and greenish blowfly, and it is advisable to consider it when dealing with our local problem. In fact, it is probably unwise to exclude any of the local blowflies in the present state of our knowledge.

In May, 1920, the writer was asked to outline a scheme of work in connection with the biological side of the inquiry, to be carried out at Dalmally, near Roma, where Mr. Russell is actively co-operating with the Queensland Blowfly Committee. In order to be more familiar with local conditions, a visit was paid to Dalmally, and then a scheme was planned, submitted to, and accepted by the committee. The Institute of Science and Industry also approved of it, but the matter was allowed to stand over until the Director should be appointed. No doubt a forward move will now be made by that body.

The scheme of work in Queensland in connection with the attempted biological control falls under two headings (*a*) measures against the adult fly, and (*b*) those which aim at destroying the larval or pupal fly. Measures designed (*c*) to destroy maggots already infesting sheep, and (*d*) to prevent sheep from being attacked, more properly belong to the chemical side of the investigation.

The plan submitted called for work along the following lines:—

A. *The Adult Fly.*—

1. Exact knowledge as to the various kinds of blowflies which frequent sheep, especially those which breed in wool on sheep.
2. Does any particular species initiate the conditions and become the means whereby others may be induced to attack infested animals?
3. Determination of factors (if any) which predispose to fly attack.
4. Seasonal prevalence of the different kinds.
5. Locality prevalence of the various species,—*i.e.,* what classes of country does each prefer?
6. Testing of various traps and baits; also poison bags.
7. Range of flight from known breeding places.
8. Enemies of adult flies—*e.g.,* ''policemen flies'' and various other wasps, certain beetles, &c.

B. *Measures against larval stages.*—

9. Determination of breeding places other than wool.
10. Study of the biology of each species, especially the ascertaining of the period elapsing between the deposition of eggs or maggots by the female and the emergence of the adult fly.
11. Use of the various chalcids. This involves a careful study of the chalcids themselves.

There are many species of blowflies to be met with in the vicinity of Brisbane, and most of them occur in our sheep country as well. The following is a list of the more important of them, but a few of those mentioned breed readily in decaying vegetable matter as well as in carrion. Many of the species have been bred from living sheep and wool:—

(1) The sheep maggot fly or hairy maggot fly, *Chrysomyia rufifacies*, often called *Pycnosoma rufifacies*. This is a fairly large species of a fine bluish-green colour. The larva is characterised by the presence of a number of prominent processes on each segment—hence the name ''hairy maggot.'' The darkly coloured pupa also possesses tubercules, though they are much smaller than those of the maggot.

(2) The small hairy maggot fly, *Microcalliphora varipes* (or *Pycnosoma varipes*) which more or less resembles No. 1 in colour and in regard to the structure of its larval and pupal stages, is a much smaller fly, being about the size of an ordinary house fly.

(3) The so-called green bottle or blue bottle flies (species of *Lucilia*), which are of about the same size as No. 1. Though they are also bluish-green they usually differ from the foregoing flies in possessing a bronzed colouration on parts of the body. Though the name *Lucilia sericata* is generally applied, it is almost certain that several distinct species are included under that term in Australia. The maggots are relatively smooth, as also are the rather thin red-brown pupæ, consequently being in marked contrast to those of the two species mentioned previously.

(4) A deep blue blowfly, rather larger than any of those already mentioned. It is called *Chrysomyia dux*, but has been referred to frequently as *Lucilia tasmaniensis.* This handsome fly is very common during the late summer and autumn in Brisbane, and is readily attracted to meat. Its relation (if any) to sheep in Australia has not been ascertained, but it is regarded as being a sheep maggot fly in the Hawaiian Islands.

(5) *Chrysomyia incisuralis,* a fly resembling the latter in size and general colouration but differing in its abdominal markings. The habits of this rather uncommon fly are not well known.

(6) *Neocalliphora ochracea,* a large reddish-brown blowfly of whose habits little is known. It is not common in Brisbane.

(7) *Paracalliphora augur,* often called *Calliphora oceaniæ.* This is a common blowfly in the vicinity of houses, and is characterised by its dark slate-coloured thorax, and by the dark-bluish broad band down the middle of the abdomen, whose sides are brownish yellow.

(8) *Neopollenia stygia,* sometimes called *Calliphora villosa.* This is also a common house blowfly, "the golden haired blowfly." It somewhat resembles the last-mentioned fly but the abdomen is more or less uniformly yellow-brown in colour.

(9) *Synthesiomyia brasiliana,* a fly with large, prominent eyes and with a reddish-coloured tip to its abdomen. Otherwise, this carrion fly resembles an oversized house fly in its colouration and markings.

(10) *Muscina stabulans*, a grey fly somewhat like a long-winged house fly in general appearance but with the thoracic stripes much less obvious. This species breeds readily in decaying vegetation as well as in carrion.

(11) The small shining black blowfly, *Ophyra nigra.* This is about the size of a house fly and is extremely common in Southern Queensland. It readily visits carrion and is regarded as one of the sheep maggot flies.

(12) *Ophyra analis,* an uncommon fly which differs from the last-named in possessing a lighter-coloured tip to its abdomen.

(13) The various flesh flies—species of *Sarcophaga*—of which about twenty are known from Brisbane. These range in size from a house fly upwards, the larger species being much bigger than any of the blowflies mentioned above. The flesh flies are characterised by the possession of three obvious black stripes on the back of the thorax, the intervening part being greyish, silvery, or golden. These flies breed very readily in carrion. Some act as parasites of locusts, &c., which are destroyed by the developing fly larvæ.

(14) One of the two commonest English blowflies, *Calliphora erythrocephala,* occurs in Sydney, but the writer has not yet observed its presence in Queensland.

Detailed observations have not been published regarding to life history of these various flies in Queensland. Nos. 1 and 2 are abundant from December to March in Brisbane; Nos. 3 and 11 are common all the year round; No. 4, from March to May and probably later; No. 7, especially during winter and early spring; No. 13, abundant especially during late summer and autumn. There is little doubt that the rainy season has a very marked effect on period of occurrence of the various species.

The following summary of results regarding some of the above-mentioned blowflies is now made public. The work has been carried out by Mr. O. W. Tiegs, M.Sc., and myself, in the University biological laboratory. My remarks relate to Nos. 1, 2, 3, 7, 11, and 13.

Eggs hatch out in the case of the most important of these in from 17 to 19 hours (Nos. 1, 2, 3). The flesh flies are larviparous, while some of the other blowflies are also at times. The larvæ feed for a period of from three to about six days in the case of the six kinds of flies mentioned. Then there follows a period of variable duration during which the larvæ do not feed and are preparing for the next stage, the pupal condition. This period of relative inactivity extends from one to four or five days, according to the weather (Nos. 1, 2, 3, 7). *Ophyra* (No. 11) and *Sarcophaga* (No. 13) take much longer, viz., from 10 to 25 in the former case, and 10 to 12 in the latter. Thus the total larval period (maggot stage) ranges from 4 to 8 days in the first group; 15 to 30 for *Ophyra;* and 15 to 17 for *Sarcophaga.* The pupal condition occupies from 4 to 8 days in Nos. 1, 2, 3, 7; from 8 to 20 in Nos. 11 and 13. Thus the number of days elapsing between the deposition of the egg or larva by a female and the emergence from the pupa is from 9 to 14 days in the case of the three bluish-greenish metallic flies (Nos. 1, 2, 3), and from 19 to 40 days for the others (Nos. 7, 11, 13). The longevity of adults bred and maintained in captivity in Brisbane was found to be from 13 to 30 days, usually about 20. It is not known how long they live under natural conditions.

An important part in regard to fly control is doubtless being played by the various wasp parasites which destroy flies while they are in the pupal condition, though the attack may be made during the maggot stage. There are at least eight such wasps now known to occur in Eastern Australia:—

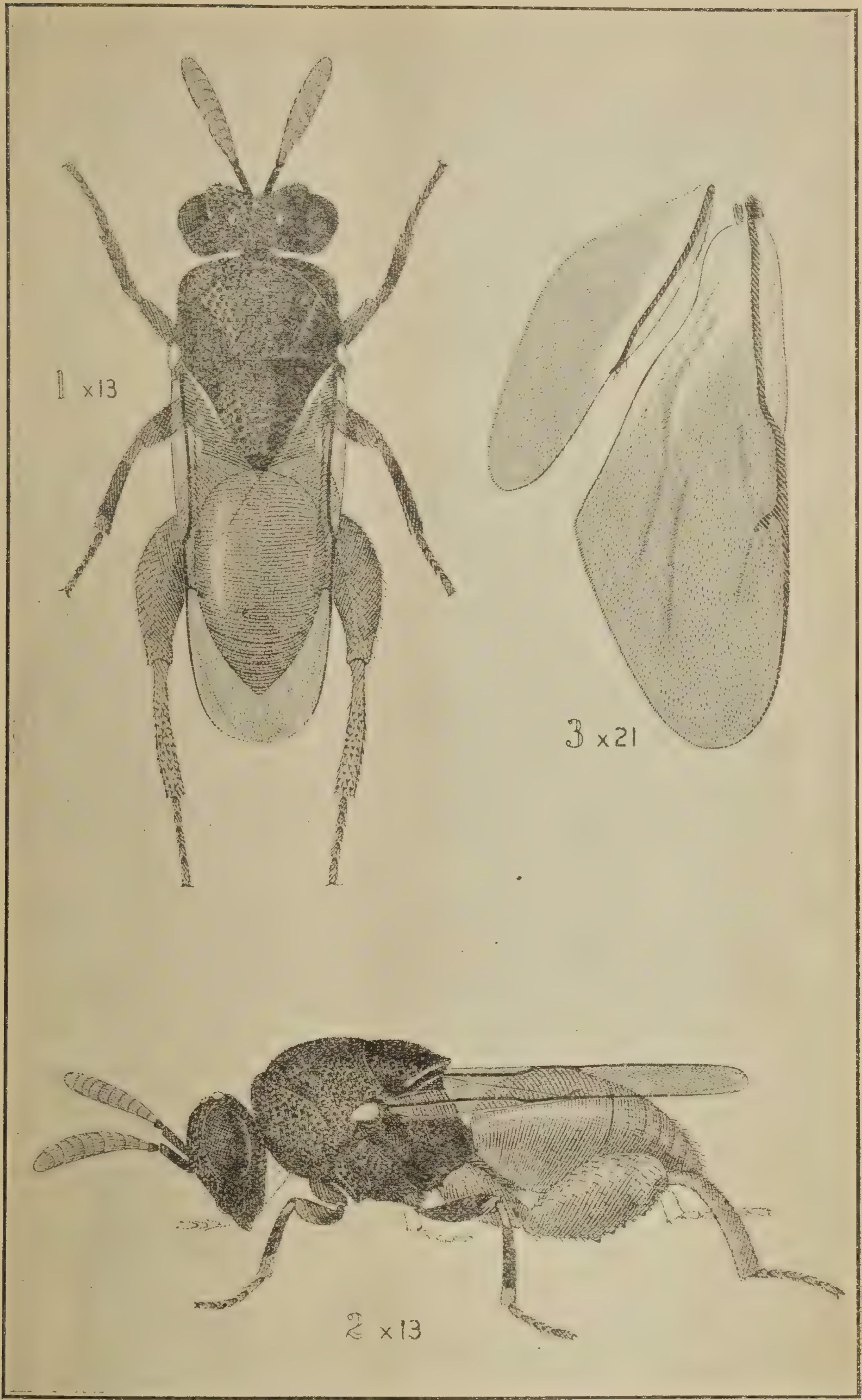


PLATE 28.—A NEW PARASITE ON SHEEP MAGGOT FLIES.

1. Dorsal view of *Chalcis calliphoræ*. 2. Side view of same.
3. Enlarged view of one of the wings.

(1) A tiny ant-like wasp of a rich metallic colour, *Nasonia brevicornis,* known generally as "the chalcid wasp" to sheepmen. It has been bred up and distributed in Queensland and New South Wales in order to assist in the fight against blowflies. In our laboratory, it was found that about 14 days elapsed between the time of oviposition of a female into a fly pupa, and the date of emergence of the wasps after having destroyed the fly. The female lays a varying number of eggs (generally about 20) in each pupa. The habits of this interesting little insect have been carefully studied by Mr. Froggatt and his colleagues in New South Wales.

(2) A small "digger wasp" (*Dirhinus sarcophagæ*) which occurs in New South Wales and Queensland, behaves somewhat like *Nasonia* as a destroyer of blowfly pupæ, except that only one wasp emerges, as a rule, from each parasitised pupa. It requires 28 days in Brisbane to develop from the egg to the emerging insect.

(3) A black ant-like wasp, *Spalangia muscidarum*, has been found to need from 21 to 28 days for its development from the egg deposited in a fly pupa to the emergence of the insect. This parasite attacks a considerable number of different flies, such as house and bush flies, stable flies, blowflies, and flesh flies. Only a single wasp emerges from each infested pupa. The species is known from Brisbane, Roma, and Eidsvold in our State. I have also seen specimens in the National Museum, Washington, U.S.A., bred from houseflies in Adelaide and sent over by Mr. A. M. Lea for determination.

Several other species of *Spalangia* are known from Queensland, having been described by A. Girault, but nothing is known regarding their habits.

(4) Another chalcid parasite of blowflies—one which attacks the maggot stage—has been named *Chalcis calliphoræ* by Mr. Froggatt. It appears to be quite uncommon. We have obtained it on only one occasion in Brisbane. Its rarity suggests that it is not an important enemy.

(5) An *Encyrtid* wasp parasite, discovered by us in Brisbane last year, differs from all the others referred to in this list except No. 4 in that it readily attacks the larval stages of blowflies, laying eggs in the maggot, which subsequently pupates but is destroyed in the pupal stage, a number of wasps emerging from each parasitised pupa in about 21 to 23 days after the eggs have been deposited. The wasp is more or less reddish-brown in general appearance, while its size is about that of *Nasonia.* The *Encyrtid* is now being bred up in the University laboratory as it promises to be a very important insect in the biological campaign against the sheep maggot fly. It should be tried in conjunction with such forms as attack pupæ, *e.g., Nasonia* and *Spalangia.*

(6) A much larger shining black wasp, about quarter of an inch in length, called *Hemilexomyia abrupta* has been found in New South Wales to attack certain of the sheep maggot flies, but is not there regarded as of much importance owing to its rarity. We have not yet recognised its presence in Queensland.

(7) There were bred out from blowfly pupæ in Brisbane on one occasion, small Diapriid wasps related to, but quite distinct from, the last-named.

(8) A small wasp-like insect, *Pachycrepoidens dubius,* known to destroy house flies, has been recorded from North Queensland. Its effect, if any, on blowflies is not known.

Of the eight wasp parasites of flies mentioned above, four (Nos. 1, 2, 4, 6) have been studied by Mr. W. Froggatt in New South Wales; and six (Nos. 1, 2, 3, 4, 5, and 7) by ourselves in Brisbane. The writer endeavoured to obtain in England a consignment of pupæ parasitised by a comparatively large Braconid wasp, *Alysia manducator,* which attacks blowfly maggots, deposits an egg in each, the resulting wasp emerging from the fly pupa. Owing to the time being midwinter, the project was not successful. In regard to fly control by those wasps which attack pupæ, it must be remembered that the accessibility of the pupæ to wasp parasitism is a very important factor. If maggots pupate in situations out of reach of *Nasonia,* &c., then they are safe. We found in Brisbane, in our experiments, that not more than 4 per cent. of the maggots pupated on the surface of the soil, even when under shelter, the remainder burrowing for varying depths into the soil before coming to rest. This fact, if generally true, greatly limits the usefulness of *Nasonia* and other wasps with similar habits. Those which attack maggots, on the other hand, would have much more opportunity to bring about infestation, owing to the wandering habits of the fly larvæ.

From the foregoing article it will be seen that, though a considerable amount of investigation has been carried out in New South Wales by Mr. Froggatt, and by ourselves in Brisbane, yet much remains to be done, especially in the field in Queensland sheep country. There is certainly urgent need for the services of a fully qualified investigator to assist in the attempted biological control of this serious blowfly menace. It would probably be advantageous for such research worker to collaborate with the University biologists.

THE BLOW-FLY PEST.

DEMONSTRATION AT DALMALLY.

The work of the Special Blowfly Committee, appointed by the Commonwealth Institute of Science and Industry, commenced at Dalmally Station, near Roma, in February, 1918. This work was an extension of earlier activities of the Department of Agriculture and Stock towards checking the ravages of the blowfly in the flocks of the State at Gindi under the direction of Mr. W. G. Brown (Sheep and Wool Expert).

The operations at Dalmally started on a few hundred sheep, and were gradually extended to the treatment of a flock of 14,000. The apparatus employed included a power dip, power spray, and jetting plant.

The committee received valuable assistance and co-operation from Mr. Russell. The work and life history of the Chalcid wasp, a natural enemy of the blowfly, discovered by Mr. Edmund Jarvis (Entomologist, Sugar Experiment Station, Meringa), at Talleyrand, near Longreach, in October, 1913, were also closely studied.

The experiments were carried out by (*a*) the use of poisonous dips treating the whole body of the sheep; (*b*) the application of poisonous dip mixtures by a strong jet directed to the breech of the animal treated; (*c*) the use of other likely dressings applied only on the breech of the sheep; (*d*) the application of arsenate of soda alone in a comparatively strong solution by dipping and jetting; (*e*) the use of soap and water in the form of a washy solution instead of poisonous dip mixture; and (*f*) endeavour by means of traps or poisonous baits to reduce the number of flies.

The soap and water solution proved a failure and the fly-trap method was not found very satisfactory.

As the circumstances under which the experiments were carried out were not altogether favourable, further experiments will be continued under the direction of Professor T. Harvey Johnston, M.A., D.Sc., of the Queensland University.

Samples of wool taken from the treated sheep were tested from time to time to ascertain the quantity and effect of arsenic in the wool and if its handling is harmful to the shearer.

The members of the committee are Messrs. S. P. Fraser (representing pastoralists), chairman, W. G. Brown (State Sheep and Wool Expert), J. B. Henderson (Government Analyst), and Major A. H. Cory (Chief Inspector of Stock), with Miss Todd as secretary.

THE DEMONSTRATION.

On Friday, 13th May, a demonstration of the spraying, dipping, and jetting processes was conducted at Dalmally in the presence of Mr. G. H. Knibbs, C.M.G. (Director of the Institute of Science and Industry), Professor T. Harvey Johnston, the Blowfly Committee, and about 200 representative graziers and others interested in pastoral pursuits. Representative visitors from other States were included in the gathering. Mr. W. G. Brown controlled the operations.

The proceedings opened with a general inspection of the plant, followed by an explanation of the several processes by Mr. Brown.

The dip specifics used were mixed mechanically, the power being supplied by a gasoline engine of 5-h.p. generating a pressure of 200 lb. It was explained that 100 lb. to 120 lb. pressure was sufficient for ordinary purposes. The liquid was conveyed by pipes to the various dips and troughs in use. The simplicity and effectiveness of the installation were favourably commented upon.

At the conclusion of the preliminary inspection of plant and lay-out, Mr. S. P. Fraser detailed the history of the efforts that have been made to combat the pest and of the investigations and experiments that followed. Professor T. Harvey Johnston lectured on the pest and the result of efforts made to check its ravages. His remarks are covered by a special paper on the subject printed elsewhere.

After luncheon, practical demonstrations of the processes found most effective were entered upon. The shower dip was the first brought into use. Sheep were driven into a long floored pen covered with a shallow perforated tray of the same dimensions of length and width. The dip mixture was pumped into the tray and fell like heavy rain on the sheep beneath. The shower continued for seven minutes, in which time the sheep became thoroughly soaked. The pen capacity is 100 sheep.

The next method illustrated was the swim-dip. The trough contained a mixture of sheep dip. The animals were forced along the race to the dip and in the course

of their 60 ft. swim were entirely immersed, two men operating alongside with crooks to ensure overhead immersion. This method was more rapid than the one previously demonstrated.

A pen of sheep was then subjected to the jetting process—first with a mixture of arsenic and sheep dip and finally with fine oil. The mixture in each instance was forced through a mechanically operated nozzle at a pressure of between 100 lb. to 120 lb. By this method only the breech of the sheep was treated; and it was explained that the process ensures immunity for a period of from two to four months. It was claimed that one man can treat in this way from 1,000 to 1,200 animals per day; besides being a preventative from blowfly attacks, it renders crutching unnecessary. This was the final operation, and the company then adjourned to the homestead lawn, where a number of interesting and informative addresses were delivered.

POINTS OF THE ADDRESSES.

Mr. W. A. Russell (Dalmally) detailed the measures undertaken and means adopted on his property to effectively combat the fly. The points he made were—

No sure preventative for a prolonged period has been discovered in the course of experiments extending over three years, but he claimed that a fly attack can be checked immediately by the jetting process, using strong arsenical mixtures which kills all maggots and arrests for a time further infestation.

Complete immunity may be secured for three or four months, but, generally, a virulent fly attack abates after a few weeks. Jetting outfits used immediately would prevent losses. On two stations the previous year, where no means were at hand to jet sheep in large numbers at the outbreak of a fly attack, the losses that followed exceeded those of the big drought. In each case the losses were estimated at 15,000 sheep all nearly fully fleeced.

So far non-poisonous specifics had proved valueless; the stronger the poison the greater the protection.

Results showed that a surprisingly small quantity of arsenic is retained in the wool. The difficulty was to "fix" sufficient arsenic in the fleece. Once it is "fixed" no insect life can exist in it. Arsenic does not appear to hurt sheep that are badly wounded, even if applied in strength up to 10 lb. per 100 gals. of water.

He intends trying a much greater strength with the object, in co-operation with the scientists on the Committee, of "fixing" arsenic in wool in such quantity as to give complete immunity, the sheep itself acting as a trap to the fly seeking to deposit its larvæ.

Jetting does away with the necessity for crutching, but, on the other hand, gives employment throughout the year.

Every specific that suggested a reasonable prospect of success was tried in the course of the Dalmally experiments. A non-poisonous compound was tried on 600 Dalmally sheep, and within a week half that number died. Another experiment with a poisonous specific resulted in the loss of fifty sheep. Analytical research was being made to ascertain the cause. Arsenic and other poisons were used on sheep in strength that hitherto would have been deemed fatal.

By analysis it has been found that some specifics are stronger in arsenical contents after having been used than before, showing that when jetting or dipping sheep with these mixtures the arsenic is not retained in the wool in equal proportions with the other ingredients; hence the reason for using all specifics stronger than would otherwise be necessary.

Jetting with poisonous dips with arsenic added costs about one-fifth of a penny per sheep.

It has been recognised that if arsenic could be dissolved in oil the difficulty would be easy, as the arsenic then would hold in the wool for a greater period; but to dissolve arsenic in oil appears to be a chemical impossibility.

An arsenic and oil mixture was tried, the arsenic being held in suspension as with all powder dips, and it appeared to act well. This process was, however, more expensive.

Reported Failures.—Jetting had, in some cases, been said to fail. This, in Mr. Russell's opinion, is only—(1) Where the arsenic has not been properly dissolved; (2) where the arsenic supplied has been of inferior grade. If anything, they were erring on the weak and careful side. Personally, he was using, or had used, specifics mixed with arsenic up to 10 lb. per 100 gals., but is not certain of its being sufficiently safe to recommend for general use.

Chalcid Wasps.—These insects, though seemingly a side issue, are a valuable factor in controlling the fly pest to a certain point. He thought they held the pest in check, although, when the fly is not very prevalent, the chalcid is also scarce. With the outbreak of a fly attack the chalcids soon appear in great numbers, and they seem to check the outbreak; or, what really occurs, a chalcid attack follows the fly, and reduces its numbers to normal.

All serious fly attacks appear to last only for a couple of months. He does not think that the local chalcid will ever destroy the fly completely, nor control it below a point harmful to the sheep, for both are indigenous and have been known for years. But if a chalcid were obtained from some other country it might prove more effective.

Each fly attack varies in its severity, according to the time of the outbreak and the species of fly prevalent at that particular period, in much the same way that grass and herbage varies according to the time that rain falls.

Trapping of the Fly.—He does not think that, from a practical point of view, this method is of the slightest value. The fly is very local, and the traps, to be in any way effective, would have to be every few hundred yards apart. They have their uses, however, in obtaining specimens of the various flies for scientific purposes, but the expense of attending and rebaiting are greater than their practical value.

Fly Fever.—This is a disease which appears in some seasons, and affects sheep as soon as struck, causing a very high temperature and great sickness, and comes with a very slight infestation. It is extremely dangerous, as blood poisoning sets in almost immediately. The affected sheep drop away from the mob and seek cover.

So far, the amount of money spent by the Institute is small, compared with the importance of the work.

Mr. J. G. Henderson (Government Analyst) said that by analysis it was found that arsenic adhered mainly to the butt and middle of the wool. In new wool its presence was greatest about the middle. He had found that the period of protection afforded by the jetting process was about three months. Mr. Russell's field experiments, backed by scientific research, had created an interest that must give rise to the co-operation of all concerned in a work of vast economic value.

Mr. W. J. Linton (Mount Abundance), representing the Scottish Australian Investment Company, strongly favoured the jetting process. A weak solution of arsenic was not effective. He had obtained excellent results from the mixture of 4 lb. of arsenic and 1 packet of dip specific to 100 gals. of water recommended as a result of the Dalmally experiments. He was so satisfied with the outcome of those experiments that jetting plants were now installed on all stations under his supervision. He had checked a serious outbreak of fly by this process, and was satisfied that it was the best method of dealing with the pest so far discovered.

Mr. W. G. Brown (State Sheep and Wool Expert) warned pastoralists of the existence of other pests besides the blowfly. He had noted the very rapid spread of stomach worm in sheep; and another parasite that required checking was the nasal fly.

Mr. G. H. Knibbs, C.M.G. (Director of the Institute of Science and Industry), said he was impressed with the force of observations made in the course of the day. The necessity of calling in chemistry and biology as aids to stockowners in preventing great economic losses was plainly realised. These losses had gone beyond the border of personal economics, and had become of national concern. Efforts to solve rural problems had national significance. He looked upon their scientists and others like Mr. Russell as performing a national service.

The Hon. Thomas Waddell, M.L.C., of Fort Bourke Station, New South Wales, said that he was much impressed by what he had seen. The blowfly pest is undoubtedly the most serious trouble sheep breeders have to fight, and it is now a vital matter to find out the cheapest and most effectual method of fighting the pest. The experience gained under the scientific and thorough methods adopted not only make for the discovery of the best specific, but, in a negative way, must do good by making known what chemicals are useless. Mr. Russell had done a great public service by allowing the experiments to be carried on at Dalmally. It is an ideal place for the work, and his thorough practical knowledge of sheep and keen intellect enables him to follow closely what the Committee is doing, and discuss with them every method that may be suggested for fighting the pest, and make him a valuable man. The method shown of wetting the sheep by a shower bath instead of subjecting them to the much rougher treatment of dipping was to him most interesting. Mr. Waddell concluded by saying that he felt well repaid for making the journey across.

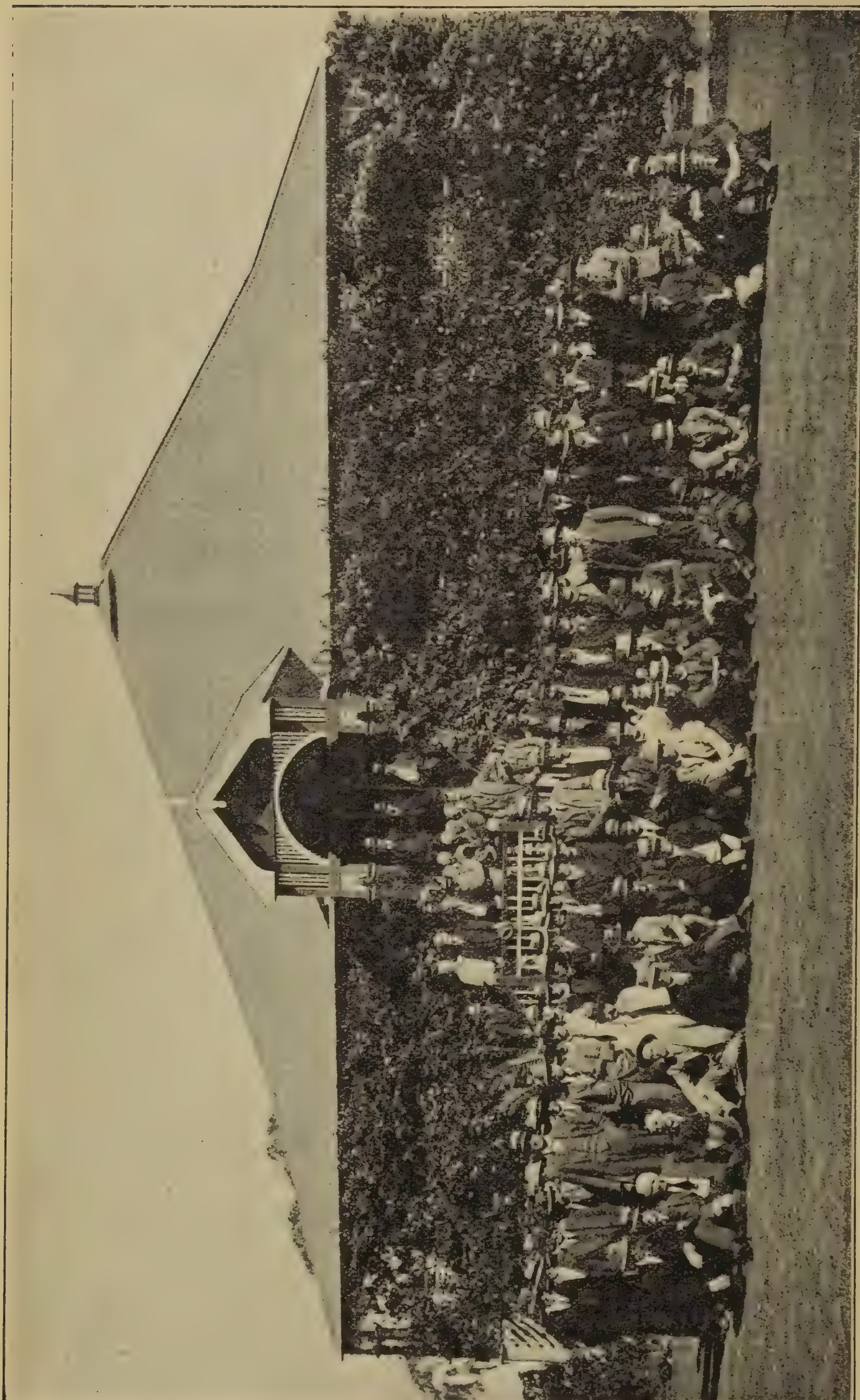
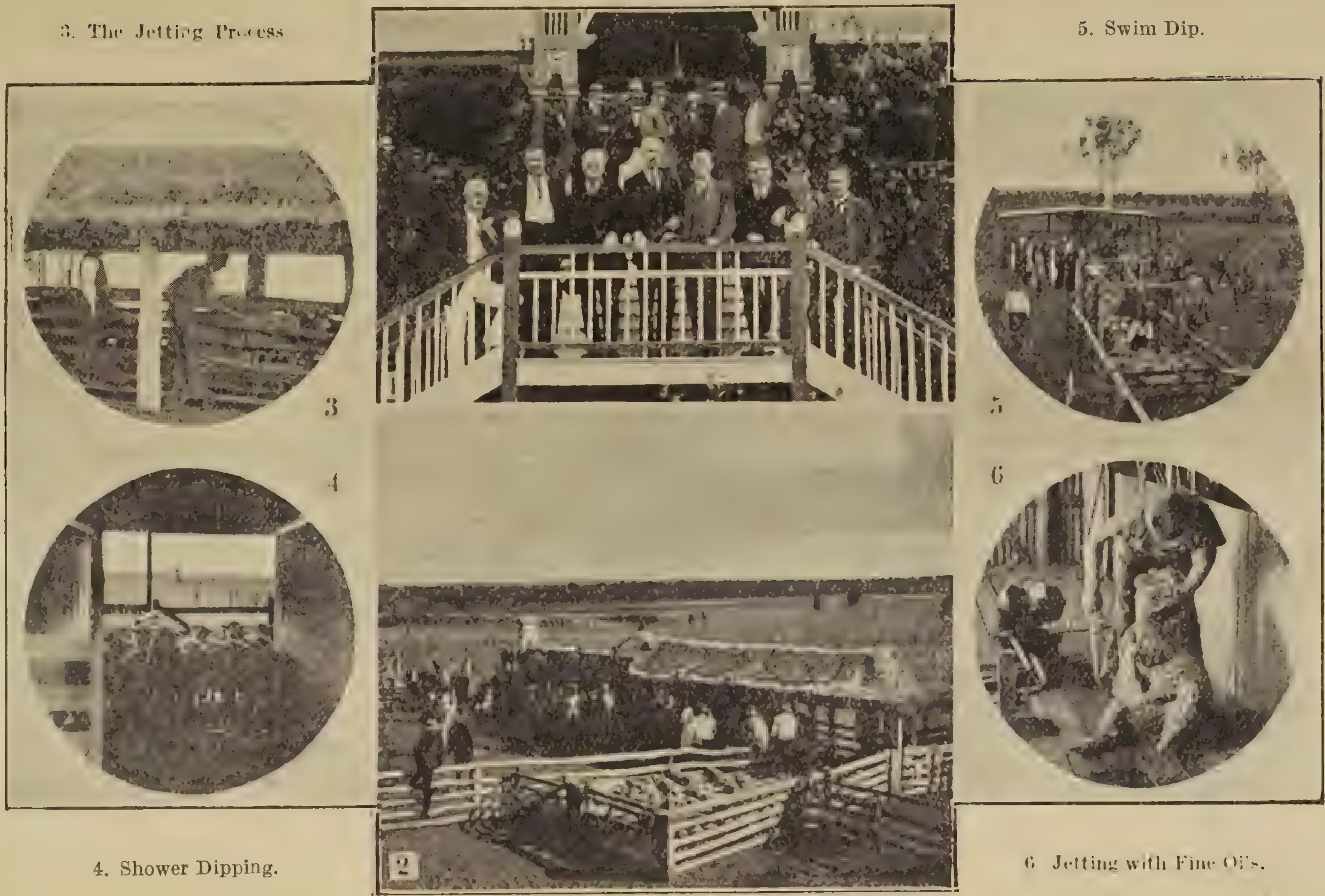


PLATE 29.—VISITORS TO DALMALLY, ROMA, RESIDENCE OF W. A. RUSSELL, ESQ. (DEMONSTRATION OF THE VARIOUS METHODS OF DEALING WITH THE BLOWFLY PEST, 13TH MAY, 1921, UNDER THE AUSPICES OF THE COMMONWEALTH INSTITUTE OF SCIENCE AND INDUSTRY).

1. Special Blowfly Committee.—*Reading from left to right:* W. G. Brown (State Sheep and Wool Expert); W. A. Russell (Dalmally); G. H. Nibbs, C.M.G. (Chairman of Institute); S. P. Fraser (Chairman of Committee); Professor T. Harvey Johnston, M.A., D.Sc. (Queensland University); Major A. H. Cory (Chief Inspector of Stock); J. B. Henderson (Government Analyst).



3. The Jetting Process.

5. Swim Dip.

4. Shower Dipping.

6. Jetting with Fine Oils.

2. General View of Yards.

Plate 30.—Demonstration of various Methods of dealing with the Blowfly Pest at Dalmally, May 13th, under the auspices of the Commonwealth Institute of Science and Industry.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, APRIL, 1921.

The weather conditions during the earlier part of the month were not such as could be desired for the commencement of a test. Rain fell during the first week, and was followed by westerly winds. There was one death, E. Chester having to replace his "A" bird in the light breed singles, the cause of death being rupture of the liver. There have been the usual mild troubles usually met with at the beginning of a test—viz., slight colds, cases of warts, and occasional ovarian disorders. There have been a few cases of moult, but not nearly so many as one would expect with birds sent in full lay as was the case with the majority which were very forward, and a number appeared as though they had been laying for a considerable time. The birds have been placed in the single pens as follows:—In the light section, "A" carries a white ring, "B" red, "C" blue, "D" green, "E" pink, "F" yellow. In the heavy breeds the colours are the same with the exception that "A" carries a black ring. The following are the individual records:—

Competitors.	Breed.	April.
	LIGHT BREEDS.	
*G. Trapp	White Leghorns ...	125
*W. and G. W. Hindes	Do.	123
R. Gill	Do.	115
H. C. Thomas	Do.	112
F. Birchall	Do.	107
*Mrs. R. Hodge	Do.	104
R. G. Cole	Do.	99
W. A. Wilson	Do.	95
*J. Newton	Do.	94
*R. C. J. Turner	Do.	91
*C. M. Pickering	Do.	88
*C. Goos	Do.	84
*Haden Poultry Farm	Do.	84
*E. Chester	Do.	84
*H. C. Towers	Do.	83
*T. Fanning	Do.	79
*W. Becker	Do.	77
*T. Eyre	Do.	76
*H. Fraser	Do.	75
*J. M. Manson	Do.	74
O. C. Goos	Do.	73

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	April.
LIGHT BREEDS—*continued.*		
Oakleigh Poultry Farm	Do.	70
J. W. Short	Do.	69
Brampton Poultry Farm	Do.	69
*Thos. Taylor	Do.	67
W. Barron	Do.	65
*E. A. Smith	Do.	64
*W. and G. W. Hindes	Brown Leghorns	61
Mrs. E. White	White Leghorns	61
M. F. Newberry	Do.	59
*B. Chester	Do.	57
E. Stephenson	Do.	56
*S. L. Grenier	Do.	53
Mrs. E. Z. Cutcliffe	Do.	52
*S. Williams	Do.	50
Bathurst Poultry Farm	Do.	48
*Mrs. L. Anderson	Do.	45
W. H. Glover	Do.	35
*H. P Clarke	Do.	20
Linquenda Poultry Farm	Do.	19
H. Stacey	Do.	17
HEAVY BREEDS.		
T. Fanning	Black Orpingtons	130
Jas. Potter	Do.	118
W. Decker	Langshans	106
Jas. Avery	Do.	103
*R. Holmes	Black Orpingtons	102
*E. Morris	Do.	102
*T. Hindley	Do.	99
Rev. A. McAllister	Do.	87
*H. M. Chaille	Do.	85
*Parisian Poultry Farm	Do.	83
*A. E. Walters	Do.	83
*E. Stephenson	Do.	80
Jas. Ryan	Rhode Island Reds	76
G. Muir	Black Orpingtons	76
*R. Burns	Do.	74
*J. Ferguson	Chinese Langshans	72
*E. F. Dennis	Black Orpingtons	62
G. Cumming	Do.	56
*C. C. Dennis	Do.	47
*J. Cornwell	Do.	35
*E. Oakes	Do.	31
*Mrs. G. Kettle	Do.	28
J. W. Newton	Do.	25
*A. Shanks	Do.	20
*N. A. Singer	Do.	19
*J. E. Smith	Do.	17
Tom C. Hart	Do.	8
F. Harrington	Rhode Island Reds	6
Total	...	4,809

* Indicates that the pen is being single tested

DETAILS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
Geo. Trapp	19	19	22	22	22	21	125
W. and G. W. Hindes	22	19	19	22	22	19	123
Mrs. R. Hodge	17	21	19	14	19	14	104
J. Newton	17	21	19	6	19	12	94
R. C. J. Turner	17	11	10	15	19	19	91
C. M. Pickering	21	15	13	7	21	11	88
C. Goos	18	22	1	10	8	25	84
Haden Poultry Farm	14	16	12	13	10	19	84
E. Chester	11	19	12	14	14	14	84
H. C. Towers	19	16	12	2	16	18	83
T. G. Fanning	18	11	14	12	11	13	79
W. Becker	13	10	14	13	18	9	77
T. Eyre	16	0	21	11	13	15	76
H. Fraser	22	7	9	1	19	17	75
J. M. Manson	6	21	14	7	18	8	74
Thos. Taylor	11	17	11	1	9	18	67
E. A. Smith	20	10	13	2	5	14	64
W. and G. W. Hindes	11	4	16	18	12	0	61
B. Chester	1	12	16	10	10	8	57
S. L. Grenier	3	18	3	16	11	2	53
S. Williams	23	8	1	2	7	9	50
Mrs L. Anderson	10	9	5	3	14	4	45
H. P. Clarke	20	0	0	0	0	0	20
HEAVY BREEDS.							
R. Holmes	19	18	15	16	20	14	102
E. Morris	20	21	13	19	10	19	102
T. Hindley	21	19	19	13	17	10	99
H. Chaille	0	23	14	25	23	0	85
Parisian Poultry Farm	1	20	19	22	7	14	83
A. E. Walters	8	19	11	14	10	21	83
E. Stephenson	12	7	19	11	12	19	80
R. Burns	5	13	25	2	20	9	74
J. Ferguson	15	16	1	13	13	14	72
E. F. Dennis	0	13	2	12	12	23	62
C. C. Dennis	12	0	0	14	17	4	47
J. Cornwell	6	4	7	7	6	5	35
E. Oakes	0	17	0	14	0	0	31
Mrs. G. Kettle	0	8	14	0	0	6	28
A. Shanks	0	0	0	12	8	0	20
N. A. Singer	3	2	0	0	0	14	19
J. E. Smith	12	5	0	0	0	0	17

CUTHBERT POTTS,
Principal.

QUALITY OF JIBBINBAR ARSENIC.

Investigation into the cause of certain parcels of arsenic despatched from the State mine at Jibbinbah being of inferior quality have shown that several casks had been filled from the first door of a flue, the arsenic from which, in the ordinary course, would have been returned to the furnace for further treatment. By an oversight those casks had been sold and sent away. When the Minister for Mines ascertained what had occurred, he took steps to trace, and, if possible, recover the casks in question. One had been found at Mackay, and was replaced, while two had been discovered at Maryborough. It was probable that one or two other casks of the inferior arsenic had been distributed, and he hoped to recover them also. As has been previously pointed out, all the arsenic is now analysed, and it has proved to be of high quality. Advantage had been taken of a temporary breakdown to "clean up" the furnaces at the State mine, the result being 50 tons of arsenic of very good quality.—"Queensland Government Mining Journal."

Dairying.

THE DAIRY PRODUCE ACT.

"*The Dairy Produce Act of* 1920" is now in force. A number of the provisions of the former Act are incorporated in the new Act in an unchanged form. Others have been amended, and requirements not covered by the 1904 Act have been added. Particulars of the more important matters provided for are summarised herein, but those directly engaged in the manufacture of dairy produce would do well to closely study the Act itself, in order to get a thorough grasp of its provisions.

The new Act requires the registration of all factories engaged in the manufacture of dairy products, and, *inter alia,* makes the grading of all milk or cream received by factories obligatory. The admixture of milk or cream of different quality is not permitted. Dairy produce must be packed under a registered brand, which should indicate the quality of the product. Particulars of the churn date and number of boxes from each churning must be shown plainly on each package; the date of manufacture and batch number is to be marked on each cheese manufactured, and on the crates containing the cheese.

The distribution of over-run has been provided for, and this provision will take effect from 1st July, 1921.

Advice cards, in the form prescribed by the Act, must accompany every consignment of butter and cheese forwarded to cold store, wholesaler, or dairy produce agent.

Under the Act all Queensland dairy produce is subject to examination and grading by an inspector. No dairy produce graded under the Act and cold stored may be drawn from storage without sanction by an inspector.

A return showing the particulars and complement of dairy produce manufactured, together with amount credited to suppliers, must be forwarded to the Under Secretary for Agriculture and Stock at given periods. The name and address of suppliers of milk or cream of indifferent quality to a factory in the course of the preceding month are to be sent to the Under Secretary at stated periods.

RECIPES FOR LIMEWASHES.

The following are recommended by the Department as suitable for milking-sheds, bails, stables, and all outside work, and particularly for roofs, to keep the buildings cool:—

No. 1.

20 lb. lime (unslacked),
3 lb. common salt,
½ lb. alum.

Slake the lime with boiling water until the consistency of the Wash is similar to thin cream. To increase its antiseptic properties, add ½-pint of crude carbolic to each bucketful of Wash.

No. 2.

To half a bucket of lime add two handfuls of common salt and two handfuls of tallow. Slake slowly with cold water, stirring all the time.

This quantity will make two bucketsful of Wash, which will possess the properties of being very adhesive and unaffected by rain.

No. 3.

Slake lime with water and add sufficient skim milk to bring it to the thickness of thin cream. To each gallon add 1 oz. of salt and 2 oz. of brown sugar or molasses dissolved in water.

The germicidal value of Nos. 2 and 3 can be increased by the addition of ¼-lb. of chloride of lime to every 30 gallons of Wash.

Before applying the Wash to wooden, metal, or stone structures, precautions should be adopted to clean the surface of foreign matter, thereby increasing the benefits of the solution. Care should also be taken to bring all crevices under the influences of the antiseptic.

For inside work in dairies and factories, with damp atmospheres, whitewashes should not be used, but the buildings should be painted with reliable sanitary paints.

The Orchard.

QUEENSLAND DATES.

BY A. H. BENSON, Director of Fruit Culture.

Although the date is undoubtedly the most valuable fruit of the hot arid parts of the world, as it not only forms a very important part of the food of the inhabitants thereof but is also exported in large quantities, its culture on commercial lines has not so far been attempted in Queensland, despite the fact that the Date Palm thrives well here and large areas of our dry and hot western country are admirably adapted for its culture when a good supply of suitable water is available. The Date Palm thrives best in a deep sandy loamy soil such as occurs in large areas in our western districts, and it will not only withstand the heat but thrives on it, provided its roots are kept well supplied with moisture.

The Date Palm is diœcious—*i.e.*, the male flowers are produced on one palm and the female flowers on another, and this is probably the reason that one seldom meets with perfect fruit in this State, as the majority of the dates that have been submitted to me from time to time are infertile—*i.e.*, the flesh is very thin and of poor quality and the seed is undeveloped.

Some two years ago when visiting the Charleville district I found fully developed seeds underneath bearing Date Palms growing in that district, and was informed that the fruit from which the seeds had been derived had been fertilised by shaking the pollen from the male inflorescence over female flowers.

Last year Mr. George Espie, of Charleville, sent me some perfect fruit which was of exceptional quality. The fruit had a thick flesh, of a tender nature, and a comparatively small stone, and belonged to the type of the roundish-oval soft dates. The fruit was excellent when fresh, but I had no opportunity of determining its value for drying purposes.

There are many varieties of dates, which vary considerably both in the shape, texture, quality, and size of the fruit, as well as in the size and shape of the seed, but the dates sent by Mr. Espie would undoubtedly rank as first-class table fruit.

A photograph of a date tree in full bearing from Mr. H. J. Walton, photographer, Charleville, who informed me that the tree was grown by Mrs. Matthias, of Charleville, and was the same one from which the dates forwarded to me by Mr. Espie were taken, is reproduced herein.

The following information has been supplied by Miss J. Matthias in reply to my inquiries:—

"The palm tree shown in the photograph is seventeen years old, and was raised by chance from a seed, and has borne fruit since it was seven years of age. It bears annually a crop of from 12 to 13 bunches."

This is an excellent return and compares very favourably with that obtained from the date palms grown in Northern Africa and the Persian Gulf area.

The illustration gives a good idea of a bearing Date Palm and shows how well adopted our western country is for the production of this fruit. Should anyone purpose growing this fruit commercially it would be interesting for him to know that the palms are raised either from seed or from suckers that come away from the base of a bearing plant. In the case of the former, it is uncertain whether the resultant plant will be a male or female, consequently if seedlings are planted out there will be in all probability at least half males, but there is no certainty as to quality, a large number of inferior sorts resulting from the growth of seedlings. On the other hand, when suckers are taken from the base of a bearing plant all females will be obtained, and the quality of the fruit will be equal to that of the parent palm. Great care, however, must be taken in removing the suckers from the bearing palm, as they should not be removed until they are at least two or three years old and well rooted. They are then carefully removed from the bearing plant and put out in their permanent position, where they are kept regularly watered every two or three days until they have become well established. The only irrigation necessary once they are established is to apply sufficient water to maintain the requisite quantity of moisture in the soil for the proper development of the plant.

In setting out a plantation, the palms should be about 30 feet apart and there should be one male palm to twenty females, as the one male palm will be able to supply a sufficient quantity of pollen to fertilise the bunches of twenty female plants.

PLATE 31.—DATE TREE IN FULL BEARING WITH RIPE FRUIT, CHARLEVILLE.

STRAWBERRY CULTURE.

BY ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

Although the strawberry is commonly considered to be better adapted to the climate of the temperate zones than to that of the semi-tropics, it is, nevertheless, the one berry fruit which can be grown to perfection in this State. Excellent fruit is produced in our Southern coastal districts and even under tropical conditions such as those existing at Townsville, when the plants are grown on alluvial soil and are well irrigated. This shows that the strawberry has a wide range in this State and that it can be grown successfully over the greater portion of our Eastern coastline and the tableland country adjacent thereto, provided there is either an adequate rainfall or, failing that, a supply of water for irrigation.

The commercial cultivation of the strawberry is, however, confined mainly to those districts possessing a regular rainfall, and extends from the Redlands Area in the South to Bundaberg in the North. When grown under suitable conditions in this district, the strawberry has proved itself to be an early and prolific bearer, able to stand a fair amount of hardship, in the shape of dry weather, and to resist the attack of insect and fungus pests to a greater or less extent.

There is a good demand for the fruit, either for immediate consumption in this and the Southern States or for conversion into jam, and, as few crops yield a quicker return, it frequently enables a beginner to make a living whilst more slowly maturing fruit crops are coming into bearing. Many a pioneer fruitgrower has to thank the strawberry for his start, as it enabled him to make a living where he would, in all probability, have failed otherwise, and what applied in the case of our pioneers still holds good with the beginners of to-day.

Our strawberries are of excellent quality and carry well, so that they reach their destination in the Southern States in good order when carefully handled and packed, provided the weather is not excessively warm or the fruit over soft on account of excessive rainfall. The fruit is very suitable for jam, and the product of some of our local factories is not excelled elsewhere in the Commonwealth; further, the demand for strawberry jam exceeds the supply, so much so indeed that, for a considerable period of the year, it is not procurable. There is therefore room for the extension of the industry as the price realised for good strawberry jam in the Commonwealth should enable both producers and manufacturers to obtain a satisfactory return.

SOILS FOR STRAWBERRIES.

Given suitable climatic conditions, strawberries will thrive in most soils, but the ideal soil for this fruit is a rich loam of medium texture, well supplied with humus, possessing perfect natural drainage, and capable of retaining moisture during dry spells—and the nearer one can get the soil to this ideal the better the results. Heavy, cold, badly-drained soils are not suitable, but any good loam or sandy loam, whether of scrub or forest origin, can be made to produce good berries if properly treated.

PREPARATION OF THE SOIL.

There is only one way to prepare soil for strawberry culture, and that is, *thoroughly*. Nothing else will do. In the case of virgin scrub or forest land, which is, as a rule, fairly rich in humus, the land, after it is cleared, should be broken up deeply and brought into a state of as nearly perfect tilth as possible. On virgin soil, except it is of the poorest nature, it is not necessary to apply any manure for the first crop, as there is usually an ample supply of available plant-food and humus present in such soil, but for subsequent crops, or old land, systematic manuring is very important. Old land that is at all deficient in humus should have that deficiency made good, either by the application of a heavy dressing of farmyard or stable manure, such as a load to every 4 perches, or if this cannot be obtained, then by growing a green crop such as cowpeas or other legume which has been well manured with phosphatic and potassic manures and ploughing it in. The green crop so ploughed in should be allowed to rot and, when rotten, the land should be reploughed and worked down fine. If the green crop has received a generous dressing of phosphatic and potassic manure, then there will be no need to apply any further fertilising material to the land, as a complete manuring has been given; but if not, then the soil should be treated as recommended later on.

The surface of the land should be kept as even and level as possible, and, as already stated, it should be worked down fine, so that when the young plants are set out they will take hold of the soil at once and become firmly established.

Planting strawberries on raw land, sour land, or land that has been indifferently prepared, is only courting failure, whereas, when the planting is carried out as advised, there is every chance of success.

SELECTION OF PLANTS.

Always obtain strong runners from healthy, prolific plants. The first runners next to the parent plants are to be preferred, as they are usually the most vigorous and best rooted, and, further, they come into bearing earlier; but, failing these, any well-rooted, strong, well-grown runners can be used, and although they will not fruit as soon as the first runners they will give a good yield later on, and frequently continue to bear when the earlier fruiting plants have ceased.

PLANTING.

Having secured suitable plants, trim the straggling roots with a sharp knife and plant as shown in the illustrations herewith, which are self-explanatory. Careless

No. 1.

No. 2.

No. 3.

No. 4.

planting is responsible for many failures, especially too deep planting, as no strawberry will thrive if its crown is buried under the soil.

The distance at which to set out the plants varies somewhat in different districts, but it is not advisable in any case to overcrowd the plants, but to allow plenty of room. Personally, I favour planting strong plants at from 20 in. to 2 ft. apart each way, so that when planted the land can be worked all round the plant; or if row planting is desired, then the rows should be about 30 in. apart and the plants set out at from 15 to 18 in. apart in the row. The illustration of a strawberry garden at Mooloolah shows the manner of planting adopted by one of our most successful growers, and it will be noted that the plants have plenty of room and are in no way overcrowded.

CULTIVATION.

Strawberry plants must only be surface-worked whilst growing or bearing fruit. The object is to keep down weed growth and to prevent the surface of the soil caking; but the cultivation must never be so deep that it will injure the roots. The best implement to use is the Planet Junior hand cultivator or similar machine; or, failing that, a good Dutch hoe of any type that may be preferred.

Weed growth must be kept down and the surface of the soil must not be allowed to become hard and set, as if it does the evaporation of moisture from the soil will be greatly increased, and it will dry out rapidly.

If the plants are to be kept over for a second or third year, then the whole of the runners, other than those required to make good any losses in the original plants, must be removed, and the ground between the original plants must be well broken up and manured in late summer or early autumn, so that the plants will be in good nick for producing a crop of fruit the following season.

If the plants have been badly attacked by leaf blight it is a good plan to cut off all the leaves and burn them prior to working and manuring the land, as numerous fungus spores are destroyed thereby. The burning off is best done by scattering a little loose dry straw over the plants when the leaves have been cut off and have dried, and then setting fire to the lot. A light burning does not injure the plants, but is decidedly beneficial.

PLATE 32.—A STRAWBERRY GARDEN AT MOOLOOLAH.

MULCHING.

This is seldom practical in this State, and it is of very doubtful value under our local conditions, a light surface soil mulch, such as that produced by working the land with a Dutch hoe or Planet Junior hand cultivator, being all that is necessary.

MANURING.

The strawberry is a fruit that requires an abundance of readily available plant-food, and one that pays well for systematic and judicious manuring. In the 1920 edition of his pamphlet, ''Complete Fertilisers for Farm and Orchard,'' the Agricultural Chemist to this Department gives the following advice, which it will pay to follow:—

''Some of our coastal country, between the 26th and 28th degrees south latitude, is particularly suitable for strawberry culture, frequently producing quite phenomenal crops. Some of our rich loamy soils found in our coastal scrub lands give the best results. In poorer sandy soils the improvement effected by artificial fertilisers, particularly such containing potash, is very marked.

''A complete fertiliser for strawberries should contain 7 to 8 per cent. phosphoric acid (water soluble), 8 to 10 per cent. of potash, and 3 per cent. of nitrogen, and should be used at the rate of 5 to 9 cwt. per acre.

''The following fertiliser mixture may be found useful:—

3 to 5 cwt. basic or ordinary superphosphate
1½ to 2 cwt. sulphate of potash
1 to 1½ cwt. sulphate of ammonia, or nitrolim, or nitrate of soda
} per acre;

or,

1 cwt. fine bonemeal
4 cwt. superphosphate or basic superphosphate
2 cwt. sulphate of potash
1½ to 2 cwt. nitrate of soda
} per acre;

the latter applied by two or three top-dressings, at the rate of 1 cwt. per acre, when fruit is first forming, and thereafter at intervals of two weeks.''

GREEN CROP MANURING.

When dealing with the preparation of the soil, the importance of providing an adequate supply of humus was referred to, and the statement made that where a sufficient quantity of farmyard manure was not available to supply this essential ingredient to the soil green crop manuring should be used to make good the deficiency. Humus plays a very important part in the composition of soils, and especially so in those devoted to strawberry culture, as its presence in the soil enables it to retain a much larger percentage of moisture than it would do were it deficient in humus. The power to retain moisture is of the greatest importance in a soil devoted to strawberry culture, as the strawberry is a shallow-rooted plant that soon suffers when there is any lack of moisture.

Moisture in the soil also enables the artificial fertilisers applied to become available, as they are of no use whatever to the crop unless their plant-food is capable of being dissolved by the soil moisture, and can thus be obtained therefrom by the roots of plants. When leguminous crops are grown as a green manure they should be manured with a fertiliser containing lime, citrate-soluble phosphoric acid, and potash; such as a mixture of finely-ground island phosphate and a potash salt, used in the proportion of four of the former to one of the latter. No nitrogen need be applied, as the plants will obtain their own from the atmosphere; and when they are ploughed into the soil it will not only be enriched by the plant foods contained in the fertiliser applied to the soil to produce the green crop, but also by the nitrogen that has been produced by the green crop itself; the whole forming a complete fertiliser, as it contains all the essential plant-foods in an available form. Green crop manuring is the cheapest way in which to apply nitrogen to the soil, so that, taking into consideration its value as a supplier of humus, it is of the greatest value when intensive cultivation is intended; and as the strawberry is a crop that demands intensive cultivation, its importance cannot be over-estimated, especially in soils that are deficient in humus. Cowpeas, vetch beans, small Mauritius beans, and the large black Mauritius beans are the best legumes for summer growth and vetches or tares and the grey or partridge field pea for winter.

MARKETING.

Fruit for immediate consumption should be gathered whilst still quite firm. It should be carefully handled, graded for size and colour, and packed in boxes or trays containing a single layer of fruit. The use of punnets is not so satisfactory, as the fruit is more likely to be bruised, and it is doubtful if the methods of marketing the fruit in single layers can well be improved upon. Fruit for factory use is stemmed, placed in casks or other suitable receptacles, and forwarded as quickly as possible to the factory. Care in handling, picking, grading, or packing, always pays.

DISEASES.

The most serious diseases of the strawberry in this State are those of fungus origin—viz., leaf blight and mildew.

The former can be controlled by the use of Bordeaux or Burgundy mixture applied as a spray, combined with the burning off of affected leaves, as previously mentioned; and the latter can be kept in check by means of sulphur applied in a similar manner to that employed for the treatment of oidium in grapes, or by spraying with sodium or potassium sulphide or a weak solution of lime sulphur. Insect pests seldom do any very serious injury, but when leaf-eating beetles or other leaf-eating insects are present they can easily be destroyed by spraying with arsenate of lead.

VARIETIES.

Although most of the standard varieties of strawberries have been grown in Queensland at one time or another, experience has shown that no one variety has proved permanent, but that it has been necessary to either raise new kinds from seed or to introduce them from elsewhere. Varieties producing perfect flowers have proved more profitable than pistillate sorts and are therefore most commonly met with.

After being grown in this State for a few years most varieties become weaker in growth, more liable to disease, and less prolific, so that they have to be discarded. The introduction of new sorts is thus essential, and there is no better way of doing this than by raising local seedlings. Some of the best sorts ever grown in the State have been locally raised seedlings, of which the *Aurie Anetta* and *Phenomenal* are good examples, and there is no reason why sorts equal or even superior to these should not be produced. Of the well-known standard varieties, such as *Marguerite, Trollop's Victoria, British Queen, Pink's Prolific, Federation, Melba,* and *Edith,* and several others that have been grown from time to time in this State, few are now planted. *Phenomenal* (a Gympie raised seedling) is now the variety most commonly met with; other new varieties are being tested and some of them may prove to be adapted to our local conditions. The type of strawberry best suited to this State is a vigorous healthy grower—that is, a good bearer and producer of good coloured fruit of good, firm texture and fine flavour; a fruit that keeps and carries well, and that meets the requirements of both the fresh fruit trade and of the jam maker.

ORCHARD NOTES.

Mr. Charles Ross, Instructor in Fruit Culture, reports on a recent visit to the South Coast as follows:—

Among the ravines on the east and north-east slopes of Beech Mountain I saw some 400 or 500 acres of real sub-tropical scrub—typical banana country. The area is situated within 7 miles of Nerang Railway Station, and 10 or 12 miles from Southport. The soil consists of strong shaley, clayey and volcanic loams, highly suitable for banana culture. Two small plantations of 2 or 3 acres each, planted sixteen months ago, have made splendid growth, and, in spite of lack of attention to suckering, an overgrowth of weeds, and the production of a good crop of maize, some of the stools are carrying bunches of from 10 dozen to 12 dozen fruits. One hand held nearly 40 fingers of a good marketable size.

I should like to emphasise that it is a mistaken policy for growers to allow more than two stems per stool for carrying the mother (or first) crop, and for future crops three to four followers are ample. By adopting this method of pruning the product, the aggregate will be better and heavier and the period of production will be extended by several years. In several instances I noticed in the aforementioned plots fifteen to twenty-five suckers per stool; this means a much shortened life and an inferior product.

Of a visit to Boonah, The Nest, Aroo, and Coochin Coochin, for the purpose of examining young grape vines and citrus plantations previously recommended, Mr. Ross reports:—

I found that the vines from last year's cuttings had struck well and had made good growth. The percentage of misses was small. All the citrus trees planted last year had done well. Old trees planted in stiffish soil on dry ridges, which did well enough whilst young and vigorous, are now in a bad condition and pest-infested. I gave instructions for the rooting up of worthless subjects, the persistent and systematic applications of sprays, the choice of sites, varieties to plant, and future culture of new plantations in lighter soil and better-drained situations.

Horticulture.

GARDENING FOR AMATEURS: ROSE-GROWING.

BY E. W. BICK, Curator Brisbane Botanic Gardens.

To grow roses to perfection it is necessary to have a good heavy soil, healthy well-rooted plants, plenty of light, manure, and water. The first thing to be done is to choose the position of the rose beds. In small gardens, of course, too often there is not much choice in the matter, but those who are more fortunate and have plenty of room should choose a nice open situation and the best soil possible. Do not plant near to large trees, or in too sheltered a position; the trees rob the soil, and the very shady situation produces mildew, other diseases, and often weak, spindly growth. An easterly aspect for the morning sun is the best, but too much stress should not be laid upon this, as long as a nice open position is provided. After selecting the position preparation of the soil follows. The beds should not be large, say, to hold about a dozen plants. If larger are required, make them wide enough to hold about three rows, the plants to be from 3 to 4 ft. apart, the robust growers to be the greater distance.

The best soil for rose growing is a nice heavy loam. Some of the red volcanic soil is very suitable, also the black, the worst being dry, hot, sandy ground; but roses may be grown in almost any soil, for this can be improved by treatment. The Brisbane shale, by plentiful use of manure, will grow excellent roses. If the soil be very heavy—i.e., a large percentage of clay, for instance—it may be improved with a good layer of ashes and a dressing of lime once a year. The lime sweetens the soil also. Light soil requires an addition of heavy stuff—sometimes this can be obtained by trenching. This latter is necessary if the bottom soil is very stiff, sometimes a double-spit digging is sufficient. If this is done, work in plenty of manure—horse and cow manure mixed is best and sheep manure is also very good; all these should be fairly well decayed. In light, sandy soil work in decayed vegetable matter—leaves, &c., and wood ashes; the firstnamed will provide humus, and in conjunction with the ashes will help retain moisture. It is important that these and manure be worked through the soil. Don't leave them in layers.

For planting, June is about the best month; a month earlier will not be harmful, or a week or two later; but those planted in June will get a good hold and make growth before the hot summer weather comes. When planting, open a hole about 2 feet across and a foot deep; this will provide room to spread the roots nicely. If any of these are bruised and broken, cut off with a sharp knife. Hold the plant in the left hand at such a depth that will place the union of bud and stock about an inch below the surface of the ground, spread all roots evenly so that they do not cross each other, then throw a little loose earth on, adding a little at a time, and shaking the plants lightly to settle the soil between the roots. When about 4 inches of soil has been added, tread firmly; then add the remainder of the soil through which a handful of bonedust has been mixed. Leave a ''saucer'' around the plant to hold water, and thoroughly soak.

Pruning may be hard, moderate, or slight. To prune hard, the thin weakly or diseased wood is first removed, and the main branches are reduced to from three to five in number; these are then cut back to from 6 to 8 inches in length. Be careful to always leave the first bud below the cut pointing outwards in all cases or the new growth will grow towards the centre of the plant, making it too thick. Moderate pruning means, after the thin, weak, and dead growth is cut out, the main branches are reduced to from 4 to 6 in number and left from 12 to 14 inches in length. Light pruning is removing all dead and diseased wood, together with any thin weak growths; the tips of the shoots are shortened back. With some hybrid perpetual roses that make long, strong growths, such as Frau Karl Druschki, a lot of flowers can be obtained by pegging the ends down, putting a good curve on the stems; these will then flower at every eye. There is a marked difference of growth in roses, some being very strong and vigorous, others making very little wood. Prune the latter hard to induce growth, and lightly prune the strong grower. When cutting flowers cut long stems; don't be afraid; it is like a pruning. Cut out decaying wood at any time, it will help the plant. After pruning old plants, manure well and dress with well slacked lime. This is best applied by wetting the stems and throwing the dry lime on; sufficient will stick to kill all insect pests.

Botany.

THE CAROB AND ALGAROBA BEANS.

BY C. T. WHITE, F.L.S., Government Botanist

For some time past the Department of Agriculture and Stock and private persons have been importing into Queensland seeds of both the Carob and Algaroba Beans. As the former is also often called the Algaroba, and is in fact the original Algaroba, there has been some confusion in the popular mind between these two trees. This is unfortunate, as they are widely different in appearance, and whereas the one is only suitable for cultivation in the cooler parts of the State the latter is more particularly adapted for the warmer. As both trees, though of considerable economic importance, are little known to many persons in Queensland, the following article and accompanying illustrations are offered. For the sake of convenience the name Carob is here applied to *Ceratonia siliqua* and the name Algaroba is confined to *Prosopis juliflora,* as it is to this latter tree that now-a-days the name Algaroba seems most commonly applied.

CAROB BEAN (*Ceratonia siliqua*).

Description.—A tree 20 to 30 ft. high, leaves pari-pinnate, each leaf composed of 3 to 8 pairs of leaflets; leaflets oval, entire, paler on the under surface, coriaceous in texture, 1½ to 2 in. long, 1 to 1½ in. broad. Flowers polygamous, greenish, small, in short racemes, calyx small, soon falling off, corolla none; stamens five, pistil glabrous, in male flowers abortive, in female and hermaphrodite shortly stipitate, ovary several-ovulate, style 3 to 4 in. long, flattened, indehiscent; seeds dark reddish brown, 3 to 4 lines diameter, enclosed in scarlet sugary pulp.

Note on the Flowers.—Like another well-known plant—the Papaw—the flowers are polygamous—*i.e.,* the flowers may be distinctly male or female and borne on different trees, or hermaphrodite—*i.e.,* male organs (stamens) and female organs (pistil) growing in the same flower. This latter condition, however, is apparently rare, the majority of the trees being distinctly either male or female.

Distribution.—A native of the Mediterranean region (Southern Europe, Western Asia, North Africa). Cultivated in most warm temperate countries.

Botanical Names.—Keratea, the ancient Greek name of the tree, is most likely the origin of the generic name. *Siliqua,* Latin, meaning the pod or husk of leguminous plants.

Common Names.—Carob Bean, St. John's Bread, Locust Tree.

In his "Encylopædia of Plants," J. C. Loudon has the following very interesting statement:—"The pods contain a sweet foecula for the sake of which they are often imported into England under the name of Algaroba Beans. This word is a slight alteration by the prefix of the article *al* of the Arabic word Kharroub, whence also our English name Carob. This is generally considered the Locust Tree of Scripture. The tree is also very common in the south of Spain and often formed the principal food of the British cavalry horses during the war of 1811 and 1812."

Cultivation.—F. Turner, writing in the "Agricultural Gazette of N.S.W.," states:—"The best time of the year to sow Carob seed is in August. The outer covering of the seed is very hard, and before they are sown they should be placed in an earthen vessel and hot water poured on them, then kept near the fire till they soften. The seeds should be planted in boxes or pots and the seedlings, when strong, say about six months old, transplanted into their permanent quarters." It can also be propagated by cuttings, and on this method Mr. Turner has the following remarks to make:—"For putting in cuttings, March or April is the best month. Cuttings of the ripened wood of the current season's growth, about 6 in. long, and either heeled or cut just below a joint; the leaves should be shortened. They will strike more readily if put singly into boxes filled with sandy soil and kept in a shady situation until rooted, when they should be gradually inured to sunlight. The cutting should be rooted and ready for transplanting in about six months' time. Layers, of course, are only possible when branches are near the ground." The great advantage of propagating by cuttings, layers, or grafting is that female or pod-bearing trees can be obtained when necessary, whereas with seed one has to take the chance as to the relative numbers obtained of male and female plants, and no distinction even to the trained eye can be seen between the plants in a young stage—*i.e.,* before flowering.

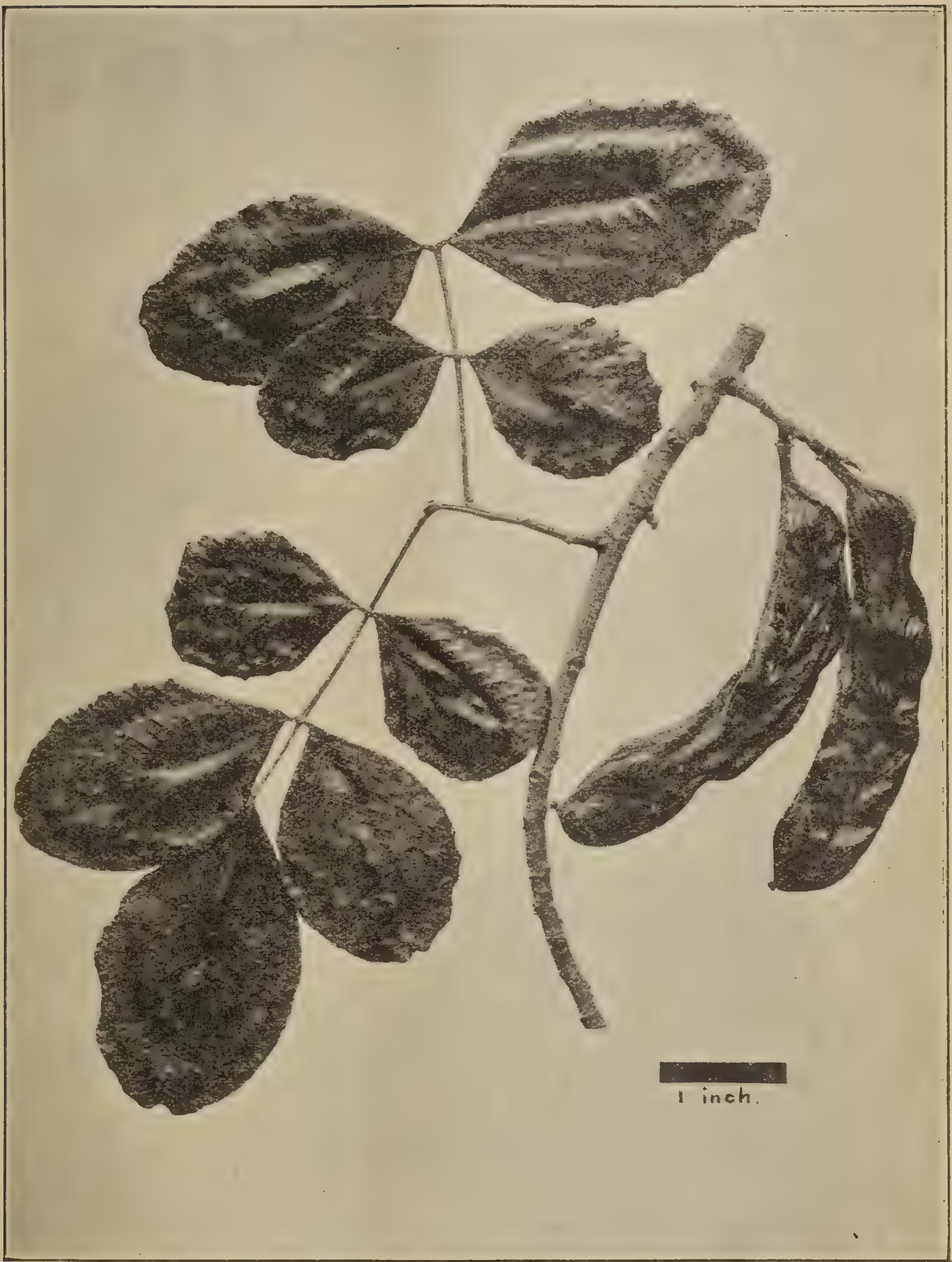


PLATE 33.—CAROB BEAN (*Ceratonia siliqua*).

The tree can be grown in the Brisbane district, but it is doubtful if it would succeed much further north, being more adapted for the cooler parts. It does well on the Darling Downs and similar localities, provided the frosts are not too severe.

As already explained, the trees are unisexual, *i.e.*, distinctly male and female; hence for pods to be formed there should be a proportion of male trees among the female to ensure fertilisation, otherwise the pods will fall off before maturity. In his article Mr. Turner goes on to state:—"If it should happen that all the trees in a group should produce female flowers only, branches bearing male flowers can safely be brought from a distance and hung among the branches bearing female ones so as to effect fertilisation. I have known this to be done with trees growing 14 miles apart and be successful. Persons who grow Carobs should keep a few bees, if it is only one hive; it is astonishing the number of flowers these insects will visit during the course of a day and be the agency whereby many of them are fertilised."

ALGAROBA OR MESQUITE BEAN (*Prosopis juliflora*).

Description.—A tree attaining 60 to 70 ft., branches usually armed with straight spines, either solitary or in pairs. Leaves bi-pinnate, usually occurring in little tufts or fascicles, pinnæ 1, 2, or rarely 3 pairs; leaflets usually 10 to 12 pairs, oblong, 3 to 4 lines long. Flowers small and numerous, borne in long slender spikes of 3 to 5 in. Pod yellow, shortly stalked, 5 to 8 in. long, marked between the seeds with transverse lines, fleshy with a sweet, sugary, more or less spongy pulp; seeds light-brown, enclosed in a hard, parchment-like casing (endocarp).

Distribution.—A native of South America, West Indies, Central America, Mexico, and the Southern United States.

It is now widely cultivated in tropical countries as a fodder and ornamental tree. Speaking of its introduction into the Hawaiian Islands, J. F. Rock in the "Leguminous Plants of Hawaii," states:—"The Algaroba is the most common as well as the most valuable tree introduced into the Hawaiian Islands. All the waste lands which previous to the introduction of this valuable tree were absolutely barren are now covered with green forests made up exclusively of this tree. The tree was introduced by Father Bachelot in 1828, the seed having come from the Royal Gardens at Paris, France."

Botanical Name.—Prosopis, origin obscure; "Prosopis" was a name given by Dioscorides to the Burdock (*Arctium lappa*), a plant very dissimilar to any species of Prosopis. It bears spiny burrs, however, and this may have led Linnæus to bestow the name Prosopis on these trees on account of their spiny nature; *juliflora,* flowers in July.

Cultivation.—Seeds should be sown in the spring or early summer. The pod contains up to about 20 seeds. Each seed is surrounded by a hard parchment-like casing. This should be removed with a sharp knife before the seeds are sown. C. S. Judd, writing in a recent number of the "Hawaiian Forester and Agriculturist," found that pouring hot water over the seeds and letting them soak for twenty-four hours greatly accelerated their germination, but they may be sown without any treatment at all, germination then, however, being considerably slower. They should be sown in pots or boxes and when strong enough the young trees can be planted out into their permanent quarters.

As in this tree the flowers are hermaphrodite, there is no need to worry over their fertilisation as in the Carob.

This tree succeeds well in the Brisbane district and fruits well. It is doubtful if it would succeed much further south, but is more particularly adapted for growing in the warmer parts of the State.

THE GOOSEFOOT (CHENOPODIUM TRIANGULARE).

Writing from Llanely, Hunterton, Mr. E. A. Thomas says:—"I was much interested in your notes in the April Journal on the 'Weeds of Queensland.' I find the Goosefoot as described is fairly common in this district, chiefly in the brigalow scrubs and on ground used by cattle for camping places. I notice also that in summer and autumn the stock do not eat much of it, but it is a great stand-by about July and August, when the usual grass fare is very much off. With the shelter from cold afforded stock by the brigalow scrub, cattle keep in excellent condition."

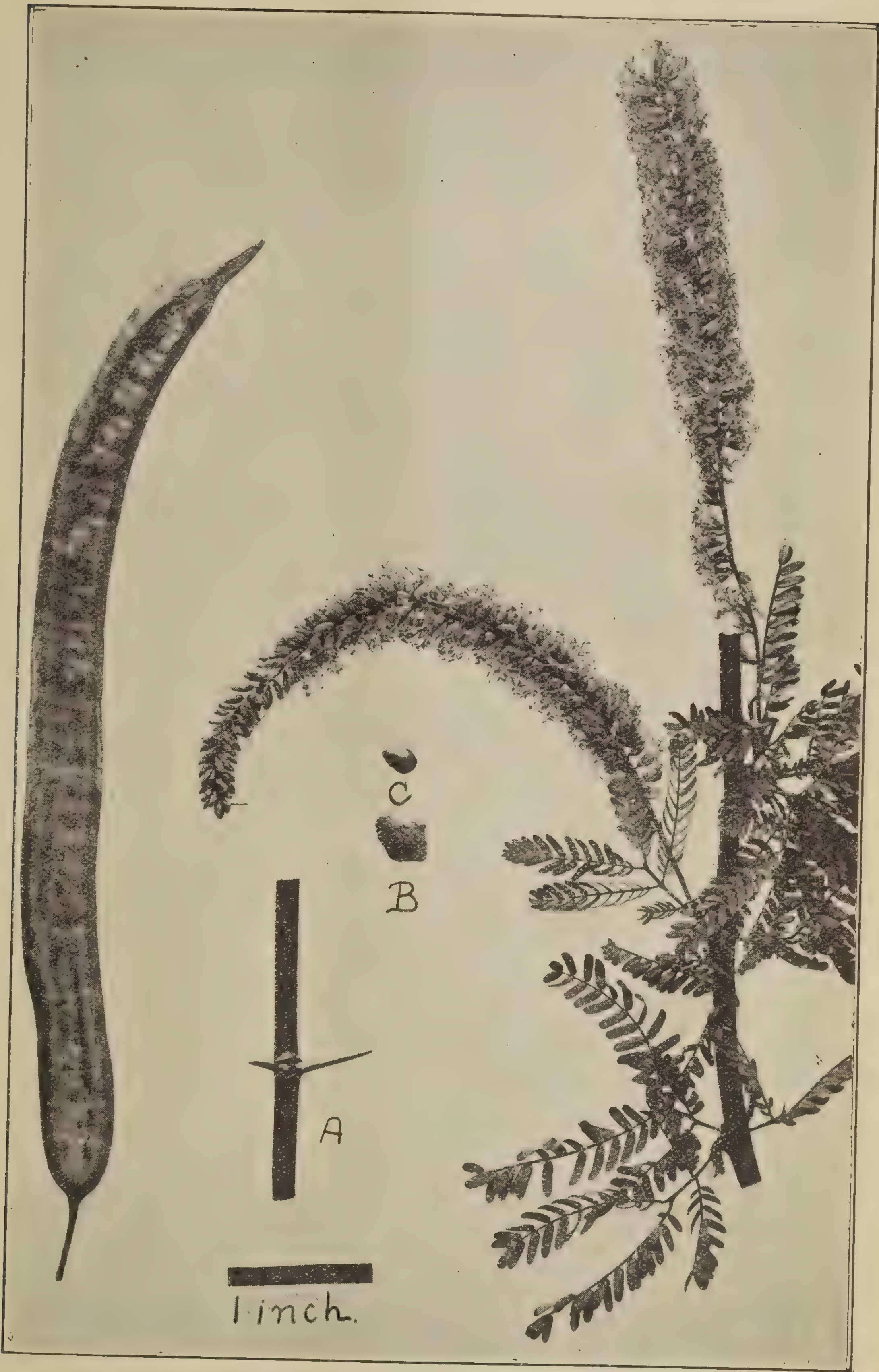


PLATE 34.—ALGAROBA OR MESQUITE BEAN (*Prosopis juliflora*).
A.—Portion of a branchlet showing the large paired spines.
B.—Seed enclosed; and C.—Seed freed from the parchment-like husk.

Forestry.

QUEENSLAND TREES.

BY C. T WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 3.

LIGNUM-VITÆ (*Vitex lignum-vitæ*).

Common Names.—Lignum-vitæ, Satinwood.

Derivation.—Vitex, an ancient name for some plant of the osier (willow) tribe (Loudon); lignum-vitæ, the colonists' name for the tree.

Description.—A tree attaining a height of 130 ft. and a barrel diameter of 3 ft. In many cases the barrel is not symmetrical, but angular, in cross section, and mostly is not prominently flanged at the base. Bark light grey, grey, or sometimes brown, often slightly fissured or wrinkled; when cut, bright yellow, measuring $\frac{3}{16}$ in. thick on a tree with a barrel diameter of 1 ft. 9 in. Young shoots, young branchlets, and inflorescence downy, with rust-coloured hairs. Younger branchlets often 4-angled. Leaf stalks $\frac{1}{4}$ to 1 in. long. Leaves opposite, elliptical or lance-shaped in outline, mostly pointed at the apex, upper surface glossy, underside dull, midrib, lateral nerves and net veins visible on both surfaces, but more prominent on the underside; measurement of leaf blade, 2 to 4 in. long, twice to three times as long as broad. Flowers few, in small forked bunches (cymes) situated in the forks of the leaves, the cymes generally shorter than the leaves. Individual flowers on stalks about $\frac{1}{4}$ in. long, each flower measuring about $\frac{1}{2}$ in. long; the lowermost part, the calyx, is cup-shaped, hairy, about $\frac{1}{10}$ in. long, and has an entire rim. On the inside of the calyx is the light purple hairy corolla which is tubular in the lower part and 4-lobed in the upper part; it is curved, and the three lower lobes are spreading or horizontal, while the upper lobe is erect; it measures about four times the length of the calyx. Inserted in the tubular part of the corolla are four stamens, in pairs; they protrude beyond the lobes of the corolla. The ovary, situated in the centre of the flower, is round and hairless, and is surmounted by a slender style about $\frac{1}{3}$ in. long. The fruit is a red globular berry, about $\frac{1}{2}$ in. in diameter, enclosing a round "stone" about $\frac{1}{3}$ in. in diameter. The "stone" contains four cells; each cell contains a mature or abortive seed.

Flowering period, irregular. Both flowers and fruit are often available at various times of the year.

Distribution.—Confined to Eastern Australia. North Coast district of New South Wales. In Queensland it extends westward to the Bunya Mountains (about 100 miles inland); our northernmost record is Baffle Creek in the extreme south of the Port Curtis district.

Uses.—As the timber is more durable than most of the scrub timbers, it is occasionally used for fencing posts. It should be useful for cabinetmaking and indoor fittings. We know of no reason why it could not be used for purposes such as flooring, as it is much more durable than pine.

References.—Vitex lignum-vitæ. A Cunningham, ex Schauer, in A. de Candolle's "Prodromus," vol. XI., p. 692; Bentham, "Flora Australiensis," vol. V., p. 67; Bailey, "Queensland Flora," Part IV., p. 1179.

Photo. by the author.]

PLATE 35.—LIGNUM-VITÆ (*Vitex lignum-vitæ*), Kin Kin.

Photo. Dept. Agriculture and Stock.]

PLATE 36.—LIGNUM-VITÆ (*Vitex lignum-vitæ*).

The two lobed leaves at the bottom represent leaves from a stump growth.

THE TIMBER FARM AND ITS PRODUCTS.

By E. H. F. SWAIN, Director of Forests, Queensland.

I have met quite a number of agricultural farmers who have indicated to me their belief in the dispensability of the forester and his forest.

Among others, was an amateur agriculturalist, who was also a business man and who on encountering some difficulty in securing a coveted corner of a State Forest upon which to grow ''one blade of grass where two trees grew before,'' vouchsafed the opinion:—''The sooner the forest reserves are cut out and thrown open, the better for the country.'' Asked what he would do for timber when that consummation was attained, he guaranteed the materialisation of an abundance of cheap substitutes from somewhere in general and nowhere in particular.

That morning my friend had risen from a wooden bedstead in a wooden house, pulled up the wooden venetian blinds, and at his wife's request, transferred the baby from the wooden cradle to the wooden perambulator, and promenaded it along the wooden veranda on the side protected from the hot morning summer sun by umbrageous trees. His wife in the kitchen had lit the wooden fire, and from the taps there, and in the bathroom, had flowed the water conserved by the mountain forests and brought to his home through metal pipes mined with the aid and protection of wooden-handled tools and mine props. The wooden safe and the porridge ladle had contributed towards his well-being whilst he brushed his hair with a wooden-backed hair brush and used a comb made of a mixture of woodpulp and camphor from the camphor laurel forests of Japan. A pair of leather slippers made of brown paper that once was part of a tree encased his feet and protected them against the cold linoleum that once grew in Spain as the bark of the Cork Oak forests. At breakfast he sat down on a wooden chair at a wooden table, and consumed meat and cereals and drink grown under the lee of neighbouring protective forests and brought therefrom in wooden cases and wooden carts. In front of him was the morning paper, the issue of which had swallowed up several scores of acres of pine forest in the United States of America. Having refreshed himself, he picked up a wooden toothpick, struck a wooden match, lit his wooden pipe, grabbed his wood-pulper ''leather'' case, and took his wooden walking stick from the wooden hall-stand. Leaving his forest-grown goloshes behind, his feet found sufficient protection against the wood-tarred pavement and the wood-blocked streets, because the soles of his boots were made of the new patent Ironite composition manufactured from wood pulp, and the uppers were tanned by Australian wattle bark imported from South Africa. He caught a wooden train which travelled on rails supported by thousands of tons of hardwood sleepers, and was propelled by coal exhumed from buried forests. A motor-car with wheels shod by the sap of a tropical tree and a body built of Queensland timber, met the train and conveyed him to his office, where once more he sat down to a wooden table on a wooden chair, picked up a pen with a wooden handle, dipped it into ink made from the gall of the oak trees, and penned a telegram on paper grown in a forest thousands of miles away and brought thither in wooden ships. The telegram hopped from ironbark pole to ironbark pole for another thousand miles, and, in due course, as a result, his wooden warehouse was filled with huge wooden crates containing pianos, violins, organs, orchestrelles, and other musical instruments, including gramophones encased in maple cabinets and records made from wood pulp.

For by the sale of these wooden things my friend lived.

The end of a perfectly wooden day was that he dropped into another wooden place on his way home, levied on a wooden cask for a fluid made from hops grown on wooden stakes, and buried a contented face in a head of foaming froth brewed from the bark of Quillaia Saponaria, a tree from a South American forest. Much refreshed, he made his way home, a wooden toy under one arm for his son and heir, and under the other a bottle each of forest-grown quinine and eucalyptus oil for his wife's cold. *En route,* he devoured with vast satisfaction the detailed statistics and full account of the greatest national event of the year—Macartney's stylish display in England with some bits of wood. That night, after two hours' blissful nursing of a wooden billiard cue, my friend returned once more to his wooden bedstead more than ever convinced in his wooden head that forests were an entirely unnecessary commodity, and that foresters might be grouped generally with price-fixing commissioners as unmitigated public nuisances.

And my friend slept well that night because the baby was bluffed by a forest-grown rubber dummy protected by an ivoroid disc made out of distilled wood.

Some of my friends may repudiate the wooden comforts of the city and deny an indebtedness to the forest equally as great as that of the piano seller. Acknowledgement will be made, however, to wood as timber for farm houses and barns, fences, and pig troughs, cow-bails, and fruit cases. It will be admitted, also, that as

a stand-by in drought, bottle-tree pith and kurrajong and wilga foliage are of some small service, and that there is a little wood in ploughs and harvesters and a modicum of caoutchouc in a milking machine. But for the bole and bark of a tree, stock whips and saddles would have neither form nor substance, and to wood is owed immunity of potatoes from Irish blight and of wheat crops from rust and smut.

Wood may be served not only raw, but also cooked, and many a delectable dish, many a work of art, and many a cunning manufacture has been and is being materialised from a forest which the community at large too often has sought to destroy as an encumbrance to progress and a barrier to civilisation.

Wood may be roasted. The roasting of wood is being carried on as a large and profitable undertaking, for instance, not 50 miles from Melbourne, where waste hardwood to-day is being converted in a long series of wood distillation products. Giant pots are filled and placed in giant ovens and baked for a day and a night. The opening of the pie discloses a thick crust of charcoal which is cooled and bagged and despatched to the city. Some of it goes to the suction gas engine which serves, among others, the soda-water maker. More of it goes to the ironworks for use in the reduction of iron to best Swedish steel. The juice of the pie is skimmed for its tar and its creo oils, which are served up to the wood-blocker and the house painter. There remains pyroligneous acid, the acid of smoke, used for expediting the curing of bacon and hams. Lime is stirred into the pyroligneous acid and acetate of lime is withdrawn and handed to the chemist. To some of it he adds sulphuric acid and puts it on the fire to warm. The brew, refined, is acetic acid, which, undiluted, becomes a cure for corns, or a solvent of oils, resins, and camphor, and diluted, serves as vinegar in the manufacture of the pickles and sauces which figure so prominently on the farmers' wooden table. The calico printer and dyer buys this acetic acid to make his sugar of lead, and compounds it with copper to produce a green pigment. When the acetate of lime is warmed up without any sulphuric acid, the result is acetone, instead of acetic acid, and this is employed either to dissolve gun cotton to make cordite to damage people, or to produce chloroform to assist in their repair. Alternatively, it may be employed to make a high-grade varnish, a celluloid collar and stud for Sunday, and a doll and a playball for Christmas morning.

There still remains in the pie a liquid residue, which, on being distilled, produces on the one hand common methylated spirits, and on the other methyl alcohol, used in the manufacture of the many brilliant coal-tar dyes. But methyl alcohol may be treated and the vapour passed through platinum gauze, when, uniting with the oxygen of the air, there is precipitated formalin, which the farmer's wife knows as a disinfectant and which the farmer himself uses to clean his seed potatoes from Irish blight and his seed wheat from rust. From formalin may be produced also artificial ivory for the piano and the baby's dummy, and imitation tortoise shell for the wife's hair comb.

According to Dr. A. G. McIntyre, of Ottawa, the earliest British works for the distillation of wood and recovery of pyroligneous acid were erected between 1790-1800, and these existed in connection with the supply of charcoal for the metal industries of the districts of Sheffield and Glasgow and the production of acetic acid and acetates for the dyeing and calico printing industries. In the United States of America to-day there are over a hundred such factories with a total capacity of consuming more than a million cords of wood per annum. In Canada there are thirteen factories producing approximately 13,000 tons of grey acetate of lime, 60,000 tons of charcoal, and 1,000,000 gallons of methyl alcohol.

Wood may be boiled as well as roasted. Chipped and put in a boiler with more than a pinch of soda, it is stewed to shreds and emerges on a metal plate as a sheet of wood pulp, the raw material for a long line of great subsidiary industries. As the daily newspaper it becomes the most important influence of modern times. Made up into books it spreads knowledge over the entire face of the earth. As writing paper it is the vital circulating medium of all trade and industry; and as brown paper it is the last hope of retail business.

We are told that the morning issue of a New York newspaper swallows up 90 acres of American pine forest. Great Britain consumes 5,000,000 tons of paper a year, to produce which about 10,000,000 tons of timber are needed. In 1918 Canada exported paper and wood pulp of the value of 132,028,000 dollars. The following year, the value had increased to 256,689,000 dollars.

But science now has ousted even the silkworm and from wood pulp is spinning commercial silk in commercial quantity, and at commercial price. Technically, the product is known as lustracellulose, which, being prepared from structureless solutions of cellulose derivatives may be said to be structureless, and therefore approximating to true silk which is produced in solution in the glands of the silkworm and extruded into the atmosphere, the worm performing the mechanical operation of drawing and

laying the threads in the specialised form of cocoon. In 1914 the American production of artificial silk was 300,000 lb. avoirdupois; in 1918 the new industry was producing no less than 13,000,000 lb.

Thus is the sericultural farmer being disposed of by a new and unexpected competition. Nor is the cotton farmer entirely free from danger, although cotton produces a better balanced and more stable form of cellulose than wood. The cotton blockade of Germany did not end the war, but resulted in abnormal development in Germany of the wood cellulose industry, which supplied both an abundance of gun cotton and of acetone, the compounding of which produces cordite. Not only were explosives thus obtained from Germany's 25,000,000 acres of State Forests, but also the very uniforms of the soldiers and the sand bags of the parapets. Since the armistice the new industry has expanded, and a recent cable announced the exportation from Germany to India of large quantities of suitings made from artificial silks and cottons, via the wood-pulping process. These new wood-pulp textiles have proved to be formidable competitors of wool, and one factor of the present wool crisis in Australia is the abstention of Germany from purchase of wool, and its substitution of clothes made directly from trees.

The wood invasion is only just beginning. Not only may silk stockings and neckties be supplied by the forester, but also felt hats, rope, twine, rug yarn, carpets, potato and onion bags, bootlaces, and braiding, and belting, and matting, paper webbing and bagging, absorbent, suit cases, trunks, leather soling, tennis shoe uppers, lace curtains, and table cloths, and even linoleum. More than 20,000 tons of wood flour, valued at 300,000 dollars, are used annually in the United States of America in the manufacture of dynamite and inlaid linoleum. A new American paper-bottle machine turns out 5,000 sanitary milk containers an hour, each bottle being finished from raw pulp in about eight minutes. One ton makes 60,000 bottles. The bottle is finished and made impervious to liquids in a bath of paraffin. The cork in the bottle, the gum on the envelope, and the postage stamp, the varnish on the motor-car, the coir fibre and the wood wool of upholstery, the art gum and eraser of the office and studio, all are derivatives of the forest. No fewer than twenty-five factories in the United States of America are using spun paper in the manufacture of fibre rugs, and one of these factories is said to be turning out 25 tons of rugs a day. Not only the logwood, Brazilwood, and fustic of South America, but also the ground leaves of our own brown stringybark furnish a commercial dye. Low-grade eucalyptus oils enable the Broken Hill Mining Company to work low-grade ores. Although no longer made of British oak, Britain's bulwarks exist by virtue of trees. My lady's toilet is indebted to the forester for some of its rarest perfumes. Bloodwood kino contains 72 per cent. tannic acid. The Queensland foambark provides a new commercial saponin. The oleo resin of Queensland kauri is almost identical with turpentine. The latex of the Queensland milkwood is convertible into plastic gum, and low-grade rubber. The silky oak and hoop pine of Queensland offer the best Australian pulp woods yet examined by the Westralian Forest Products Laboratory. The oil of the citron-scented gum may be used either to dispel mosquitoes or to scent soap. The oil of the lemon-scented ti-tree in the chemist's hands becomes lemon essence and lemonade. The ''wool'' of Frazer Island Macrozamia is a vegetable kapok. The tulipwood and the water gum make a good tobacco pipe.

Once upon a time the forest provided the entire sustenance of peoples. It can still furnish a healthful diet of game and bacon, fish and fowl, eked out by truffles and mushrooms, sago flavoured with either cocoanut or cinnamon, breadfruit, honey, and maple syrup, and sugar, together with an abundance of nuts, among which our own Queensland Bopple and Bunya nuts rank high. It also makes a useful contribution of cork and wood to the present day refrigeration of foodstuffs. It is able finally to produce the culminating liqueur. A French factory by hydrolysing the cellulose of sawdust under pressure with sulphurous or sulphuric acid is now manufacturing a large quantity of high-grade alcohol for fortifying cognac in place of beet sugar alcohol. Forests have been butchered, the climate altered, bird life interfered with, and insect pests encouraged, all through lack of knowledge and foresight.

Forest products have, in addition, other values. Loss of appetite may be remedied by Peruvian bark or our own Queensland alstonine. The sapling Cascara sagrada from the United States of America or the Rubra Gummi of the British Pharmacopœia (Red-gum gum in Australian), and eucalyptus vapour and camphorated oil will serve to relieve the colds and influenza that follow like Nemesis in the tracks of over-indulgence.

If all else fails, the last resort is again to wood!

Now that forests have become luxuries, we may begin to realise that they always have been necessities.

The present forest reservation of Queensland is proportionate to the postage stamp on the big official envelope.

Tropical Industries.

SUGAR.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, under date 19th May, 1921, from the Southern Field Assistant, Mr. J. C. Murray:—

MACKAY.—During the month of April, the Mackay cane-growing areas were visited.

The crops here are not as heavy as the abundant rainfall since the New Year might have led many people to expect, the principal reason for this being that the bursts of sunshine between wet periods have not been sustained, and the ground consequently got cold. The soil temperature is at present low, and farmers will have to hurry with their planting before the ground gets colder.

The majority of the varieties the farmers have growing are doing well, especially such canes as Q. 813, 907, 285, 426, Badila, and M. 1900 Seedling.

Cane pests are not numerous this year, although grubs on some of the areas are destroying a certain amount of cane, especially that planted near the scrub.

Borers are attacking the cane in places, but their depredations are largely checked by small ants, which are at present swarming in the cane fields. Several bored canes, on being broken, were found to contain these ants in the borer cavity.

The presence of leaf disease or gumming was not noticed in any of the varieties, although root fungus was affecting the 1900 Seedling on some farms. This may, however, be due to the very wet season and lack of warmth.

It is gratifying to note that most of the recently distributed canes are doing well, especially the Queensland seedlings, and appear to be highly resistant to parasite attack.

After this abnormally wet year, farmers would be well advised, before they plant again, to lime and green manure their soils. Borer soils are more impoverished than those which are carrying vegetation during these wet periods.

The necessity for planting canes with a good root system is borne out by the number of weakly rooted varieties that have fallen in recent winds. This is another matter that requires attention and close observance on the part of the growers.

Regarding cultivation in the Mackay district, the growers are up-to-date. Improved farming implements are in evidence, and the soil tilth is mostly good. Noxious weeds are well in hand, none being particularly troublesome this year.

BUNDABERG.—Reports received by the Bureau of Sugar Experiment Stations, Brisbane, from Bundaberg state that weather conditions are becoming more settled, and from a growing standpoint very favourable, the cane continuing to grow rapidly. It is estimated that fully one-third more cane will be harvested than was anticipated in February owing to better climatic conditions.

THE HERBERT.—The Herbert District reports that very wet weather has been experienced, preventing farming and ploughing operations generally. This will mean a good deal of late planting. The crops here, too, will not be so heavy as expected three months ago.

The excessive rains at Innisfail have also checked the cane to some extent.

Science.

DEHYDRATION.

One of the main activities of the A.I.F. Education Service, which was organised with the object of profitably employing the pre-repatriation waiting time of Australian troops, was a close study, under expert direction, of processes and problems affecting rural industries. Agricultural and stock students were enrolled and given every facility for observing at first hand British and Continental methods of farming, selection, breeding and feeding of stock, preparation of primary products for market, and subsequent commercial operations. In furtherance of the scheme, a hundred selected students, all with previous Australian rural experience, were sent to the United States to undergo courses varying in term from six to twelve months in general agriculture, pig-raising, irrigation, marketing, distribution, and allied subjects. The students placed themselves under obligation to return to Australia at the expiry of their several courses, and to assist in disseminating the knowledge gained and applying the results of their experience. All have now returned, and their influence is being felt already in rural circles.

Among matters that received close attention from the students abroad was the process of dehydration of fruit and vegetables, and one of them, Lieutenant R. G. Booth, who obtained a diploma as a dehydration process expert at the California University, recently delivered an informative lecture on the subject before the Brisbane Chamber of Commerce.

Points made by the lecturer were:—

Older methods of drying food products have not proved entirely satisfactory and, compared with the process of dehydration, are more costly. By their employment it is very hard to keep the product clean and the effect of sun-drying has not always given the best results. One particular method causes ''case-hardness'' in the product before the whole of the moisture is extracted.

Dehydration is simply the removal of replaceable moisture in such a way as not to destroy tissue, texture, and food value. By the addition of water to the dried product it returns to its original condition. It is a sanitary product right through. There is no loss of the essential qualities of the product.

Heated air circulated in such a way as to allow the escape of one-seventh of the air (air charged with moisture extracted from the product) is the base of the process. The operation is continued until the whole of the water content of the product has evaporated. The process includes pipping, peeling, and slicing.

Dehydrated product may be stored indefinitely.

By soaking in water the product is reconditioned, *i.e.*, restored to its original state with flavour and texture unimpaired.

The saving in packing, storage space, and transport charges on the dewatered product is obvious and of immense commercial importance from the growers' viewpoint. In comparison with the cost of other processes of preserving food products, the advantage is greatly in favour of dehydration.

The market for ''green'' fruit is necessarily limited, while the market for the dewatered product is more stable and is capable of vast extension.

A dehydrating plant of one-ton capacity and capable of treating two tons per day may be installed at an approximate cost of £347. The cost of operation is relatively very small. Larger plants would range in cost of installation up to £1,500. Plans and specifications in every instance would cost additionally £250.

The Germans during the blockade proved beyond doubt the effectiveness and economy of dehydration under improved processes. In that country 488 plants were in operation, and in 1917, the last year for which figures are available, 1,900 plants were operating and 2,000 breweries were using their equipment for removing water from food products.

In the United States dehydration is strongly favoured, and has been largely adopted. A department of dehydration has been organised, the whole country divided into districts, and a chemist appointed to assist in each. One plant alone handles annually 24,000 ''green'' tons product which, when dehydrated, finds a ready market.

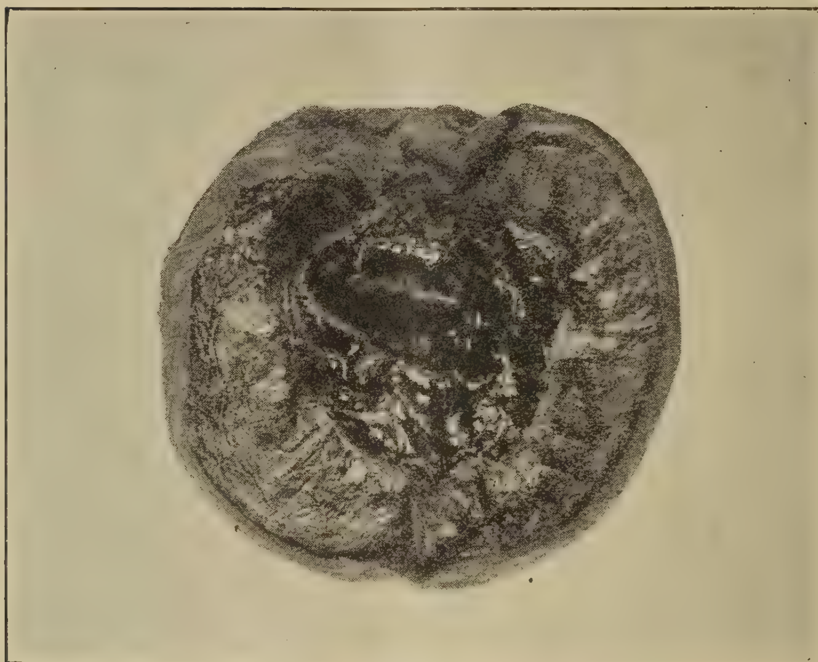


Fig. 1

Fig. 2.

PLATE 37.—DEHYDRATED PEACH BEFORE AND AFTER RECONDITIONING.

Dehydrated products may be exported and sold profitably at a low rate compared with the products of other preservation processes.

The lecturer stated that, after five months' work on one of the largest plants in California, he had discovered a process of treating a banana in such a way as to preserve its colour and return, after soaking, to approximately its original condition. The average drying time for one ton of "green" product is eight hours.

The commercial success of the process has been practically proved and its adoption will greatly simplify the marketing problem. By doubling costs and halving prices at present current in America, the Australian grower could obtain a profit of £9 10s. per "green" ton.

The lecturer strongly emphasised the value of attractive packing, of marketing only first quality product, and wide and intelligent advertisement. Legislation may be necessary to prevent the packing and sale of products below standard. The standard set by the American Service authorities is a high one, and both army and navy are supplied with dehydrated fruits and vegetables for issue with the regular ration.

Australia can profit by American experience in standardisation of products. To offer goods inferior in quality and packing is simply courting failure. The present time offers big market advantage for a product new, wholesome, and cheap. Stabilisation and standardisation would follow the adoption of dehydration by fruit and vegetable producers to their great advantage.

Discussion.—In the course of the subsequent discussion, Mr. Stirling Taylor (Director of the Bureau of Commerce and Industry) said that he had tested samples of dehydrated fruits when cooked, and could not detect any difference between it and fresh fruit. He predicted a great future for the banana industry when dehydration is adopted.

Mr. E. S. Little (Commonwealth Trade Commissioner for China) said that the fruit treated by Mr. Booth was the best dried fruit he had ever tasted. He pointed out the possibilities of opening up markets for Queensland dehydrated products in Eastern Asia, where dried fruits and vegetables were largely demanded.

The Hon. A. J. Thynne, M.L.C., remarked that dehydrated fruits had been used in his own household, and he found that the product had seemingly lost none of its original qualities. He foresaw a big future for Queensland dehydrated products.

Experiment.—A segment of dehydrated peach, obtained from among the lecturer's exhibits, has been subjected to experiment in this office by our artist, Mr. Mobsby, who then photographed the specimen (*see* plate). The subject had the usual appearance of dried fruit and after eleven hours in water regained almost remained somewhat shrunken. It may be stated that to retain the flavour when its original size, its flesh becoming a rich, golden, natural colour, though the skin using dehydrated fruits for cooking, the fruit should be first washed and then put to soak in sufficient water to cook it. The fruit should be cooked in the same water in which it is soaked. Our illustrations show (1) the peach in its treated form, and (2) how it appeared after the prolonged immersion.

SHOW DATES FOR JULY.

Biggenden District A.P.S.: 30th June, 1st July.
Mundubbera A.P.I.S.: 5th and 6th July.
Kilcoy P.A.I.S.: 7th and 8th July.
Wellington Point A.H.I.A.: 9th July.
Gayndah P.I.A.H.: 12th and 13th July.
Laidley, Lockyer, A.I.S.: 13th and 14th July.
The Towers P.A.M.A.: 13th and 14th July.
Caboolture P.A.I.: 14th and 15th July.
Kandanga, Mary Valley, A.H.I.S.: 17th and 18th July.
Nambour, Maroochy, P.A.H.I.S.: 20th and 21st July.
Townsville P.A.I.A.: 20th and 21st July.
Mount Gravatt and District A.H.I.S.: 23rd July.
Esk P.A.I.A.: 26th and 27th July.
North Pine, The Pine Rivers A.H.I.A.: 29th and 30th July.

Entomology.

THE CANE GRUB.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report, under date 5th May, 1921, upon Cane Grub Investigations from the Entomologist, Dr. J. F. Illingworth:—

For the past month (April) the Cairns district has been deluged with rain; the streams, rising far over their banks, have flooded portions of the river flats for many days at a time, while some fields have been washed away altogether, the land being left a barren waste of sand and stones. Furthermore, during this downpour we had considerable wind, and much of the heavy cane, even on the uplands, was laid flat on the ground, particularly in fields damaged by grubs. These pests, too, have continued their devastation with unabated zeal, working close to the surface of the saturated soil; hence many of our hoped-for results with arsenic, where it was placed in the bottom of the drill with the plants, has been negated. Fortunately, however, these weather conditions which have been so unfavourable for the growth of cane, have stimulated the development of the diseases of the grubs wherever the spores occurred in the soil. And again, the grub resistance of D1135 has been most marked.

GRUB DEVASTATION AND ARSENIC.

At the earliest possible opportunity when our floods abated (13th April) I went over to Greenhills Estate, where the most distressing situation was revealed; hundreds of acres of cane had turned brown, the leaves being almost dry, and some entire fields where the crop was particularly heavy had been flattened by the wind. The grubs had done serious damage practically all over the plantation. The plant cane, most of which was treated by applying arsenic in the bottom of the drill along with the plants, also suffered severely. Investigation showed that the grubs had been forced out of the layer where they would have normally been in contact with the poison, because the soil was super-saturated, and that they were eating right into the stalks at the surface.

In our experimental field of D.1135, in which the arsenic was applied in May, 1920, after the drills had been pretty well filled in by rains and cultivation, we found results more encouraging. Though the winds had bent all the cane down, as is usually the case with this variety, that in the plots which had been treated with sufficient arsenic was still firmly rooted and growing strong. Furthermore, as an illustration of the resistance of this variety, I found that even the cane in the checks, where the roots had been entirely eaten away by the grubs, had rooted from the nodes, wherever they touched the soil. This cane was growing strong again, with no indication of a shooting of the lateral eyes, as is commonly the case with Badila under similar circumstances.

The treated plots referred to in the March report, especially the one that had arsenic at the rate of 200 lb. per acre, showed splendid colour. Digging out a stool we found no grubs, and the roots were most vigorous, about 12 in. in length. This favourable result is apparently due to the poison being nearer the surface, where the grubs continued to get it, even when forced upward by the excessive wet.

I was hopeful that this year we would be able to get conclusive results, but there is evidently much more to be learnt in regard to this feature of the problem of grub-control, particularly as to the amount to use and the method of application; yet, though I am compelled to leave just when success seems imminent, I trust that this experimentation will be continued, even if it must be done by the individual growers, for I feel thoroughly confident of the ultimate success of these efforts.

GRUB DISEASES.

In my reports for January and February I alluded to the presence of the Muscardine fungus again in the fields at Greenhills. Naturally, the excessive moisture of the past month has been ideal for the development of these lowly organisms; hence a real epidemic has developed among the grubs in the fields wherever the spores occurred in the soil. On the 13th April we dug three stools in one of the abandoned fields in the same place where the grubs had died off in such numbers last season, and found only three living grubs, though there were many remains of grubs in various stages of disintegration that had succumbed both to the Muscardine fungus and the bacterial disease. Since, earlier in the year when the grubs were just hatching, we found an average of over 100 per stool in this location, it would appear that the contagion has again destroyed fully 99 per cent. of the pest in these favoured spots.

Unfortunately, these diseases do not occur throughout the plantation, for if they did it would be a serious blow to the grub pest there.

In previous reports I have recommended the inoculation of infested fields with this spore-laden soil, and consider this a most feasible line of experimentation. Moreover, it has occurred to me that this application could probably be most easily made by sprinkling a little of the infected soil over the plants in the planter. In this way every part of the field would probably become inoculated at the same time. Once we find a successful method of establishing these friendly organisms throughout our grubby areas I feel confident that it will go far towards mitigating this serious damage.

SOUTHERN TRIP.

During the month, in compliance with an urgent request from Mr. W. N. Gillies, the Minister for Agriculture, I went to Home Hill to confer with the members of the Inkerman Farmers' Association on a borer which they reported had been doing considerable damage to their cane. Fortunately I found that this was not the New Guinea beetle (*Rhabdocnemis obscura* Boisd.) which they had reported, but the far-less-destructive native moth borer (*Phragmatiphila truncata* Walk.) which is usually held well in check by the two hymenopterous parasites, *Apanteles nonagriae* Olliff and *Euplectrus howardi* Olliff. These borers were only seen in old standover cane and were doing little damage, so artificial control measures were not advisable.

A much-more-serious borer that I found there in some of the sandy-loam fields near the river was the large Termite (white ant), *Mastotermes darwiniensis* Froggatt. Fortunately this pest is not general, for if it were, no cane could be grown. The whole pithy contents of long sticks had been removed from bottom to top, leaving only a thin hard rind, which still supported the green leaves of the plant. These same "ants," I am informed by Mr. G. F. Hill, are notorious devastators in the Northern Territory, where they will not permit sugar-cane to grow at all, and even hollow out and ringbark large trees, such as figs, cocoanuts, &c. Moreover, they also destroy every organic product that is left within their reach, even eating one's boots if left on the ground overnight.

A disease closely resembling the Top-rot, of Hawaii, described by Dr. N A. Cobb,* really gives more trouble on the Lower Burdekin than any of the insect pests. This is not a very virulent disease, however, and it will probably be soon overcome by judicious selection of plants, especially in a region of such little rainfall.

EFFICIENT GRUB DESTROYERS.

During a hurried survey, both at Inkerman and at Pioneer, I was surprised to find grubs so scarce behind the ploughs. I was told, however, by observant farmers that the ibises (*Carphibis spinicollis* Reich, and *Ibis molucca* Cuvier) were always there, and I also saw great flocks of crows (*Corvus australis*) following the ploughs. Though few grubs were turned up, they found many earthworms, &c. The ibises, I was told by Mr. A. C. F. Hemsley, a collector of birds' eggs for the Associated Museums, breed in great colonies near the mouth of the Haughton River. This evidently accounts for the continued presence of these efficient grub destroyers in those districts, and probably accounts largely for the scarcity of grubs. Unfortunately the ibises are absent from the Cairns district from about February to June, at a time when they could be of the utmost service to us in destroying grubs, and the crows, as far as I know, do not occur at all.

I had many courtesies extended to me during this brief visit to the Lower Burdekin Valley, both by the farmers and the officials of the Pioneer Mill, which greatly facilitated my investigations, for which I wish to express my most sincere appreciation.

RATS, MATCHES, AND FIRES.

The Rev. A. H. Lambton, St. Alban's Rectory, Innisfail writes:—"In regard to the statement that rats do not cause fire by lighting matches, my own experience in the matter might interest you. Some years ago I was living on Charters Towers, and one night I heard a noise in the kitchen and went out to investigate. As I opened the door I saw a match flare up on a shelf above the fireplace. By the light of that 'self-lighted match' I saw a rat scampering off as hard as he could. That little experience really convinced me that rats do light matches and so cause fires."

* Hawaiian Sugar Planters' Assn., Div. Path. and Physiol., Circ. No. 5, and also given more fully in Bul. No. 6.

General Notes.

EUCALYPTUS OIL.

Mr. C. T. White, F.L.S. (Government Botanist), replies to an inquirer as follows:—

Practically the only oil being distilled in Queensland is the oil from *Eucalyptus citriodora*, the citron-scented spotted gum. Queensland is remarkably rich in these scented oils, at least two Eucalypts, two species of tea-tree, and a Backhousia possessing rich citron-scented oils. These oils are used principally in scent manufacture. On the other hand, we are poor in oils of a standard medicinal value. To comply with British Pharmacopœia standards, Eucalyptus oil must have at least a 55 per cent. eucalyptol (*i.e.*, *cineol*) content, and the United States Pharmacopœia demands a eucalyptol content of at least 70 per cent. Only one Queensland species, so far as I know, goes so high in the eucalyptol constituent of its oil, viz., the common Bimbil box or Box of the Downs and inland country (*Eucalyptus populifolia*). This is, however, a poor yielder.

Pure Eucalyptol is manufactured in Australia, but it is beyond the scope of the work of the ordinary distiller, requiring chemical knowledge. The best plan for your inquirer to adopt would be for him to let his correspondents know what species of eucalypts he has growing in his district and the price he wants for the oil. The present price for oils rich in eucalyptol is quoted at 3s. per lb. in London. It would, of course, be considerably less in Australia. They have nothing like the value of the citron-scented oils. A useful work on eucalyptus oils is "A Research in the Eucalypts and their Essential Oils," 2nd edition, by R. T. Baker and H. G. Smith, obtainable from the Government Printer, Sydney, or from the Technological Museum, Harris street, Ultimo, Sydney. It is a big book, and the price is £2.

If there are any eucalypts of which your inquirer wants the name, if he sends pieces about 6 to 9 inches long, bearing leaves and fruits or flower buds, we will identify them. It is a great help to have the local names and a note on the bark, thus—stringy, smooth, white, and so on, as the case may be.

There was an embargo on the exportation of eucalyptus oils from Australia, but this the Customs Department informs me has been lifted.

PUBLICATIONS RECEIVED.

"The Journal of Agriculture" (United Kingdom) for April contains an interesting article, the first of a series, on "Research in Animal Breeding," in which is discussed the nature of Mendel's discovery, and efforts made to acquire knowledge of laws which underlie inheritance in animals generally. "The Human Machine on the Land" is another article, in which the cost of inefficiency and misdirection of energy on the farm is dealt with.

"The Agricultural Gazette of New South Wales" for May.—Under the caption "A Promising Introduction," Mr. J. N. Whittet, Assistant Agrostologist, writes informately on Kikuyu Grass. All reports received show that this importation from the Belgian Congo is giving very good results down South, especially in coastal districts. The conclusions arrived at by the writer are summarised as follows:—"Kikuyu is propagated by means of cuttings, rooted runners, or divisions of the crown of the plant. It grows well on almost any kind of soil. Temperate situations with good rainfall are most suitable, as the grass thrives where the spring and summer seasons are long. It stands frost fairly well. Reports from other parts of the world state that it is an excellent drought resister. Spring and early summer plantings are recommended in cold districts; any time from September to March in other parts, provided the soil is moist enough to enable the plants to become well rooted. It is recommended for planting in soil subject to erosion. It should be useful in bracken fern country, as it would tend to smother the fern. It should be permitted to become well established before being fed off, as the cattle may tear up the runners if they are not well rooted. As the plant does not form seed, it should not be difficult to keep it in check if so desired."

In the same issue appears an important paper, "Tick Paralysis," describing the result of various experiments confirming the fact "that one of the so-called 'scrub' ticks (*Ixodes holocyclus*) is capable of producing a very fatal affection in animals, the main feature of which is a progressive motor paralysis."

"Tropical Life" (London) for March, in a leading article on "Cotton Growing within the Empire," calls attention, *inter alia,* to the expansion of the cotton industry in the United States of America with consequent depletion of supplies of raw material for British and Continental manufacturers. A big market is therefore created for raw cotton, and the demand is increasing much faster than the supply. "The tendency is for prices to harden and the grower need have no fear of over-production." On the cotton outlook the article goes on to say—"Of the world's population about 500,000,000 are properly clad, 750,000,000 partly dressed, and 250,000,000 practically naked. The population of the world is getting more civilised, and the first requirement, next to food, is clothing in some form. The production of other textiles is so limited that at present the only solution seems to be in a much greater production of cotton."

It is interesting to note that the article, while describing efforts to open up more cotton fields in the British Dominions, makes no reference to Queensland's possibilities in that connection.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING APRIL, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1921.	April, 1920.
North Coast.	In.		In.	In.
Atherton	4·33	20	11·59	4·03
Cairns	12·00	39	19·72	19·37
Cardwell	9·99	49	3·38	15·32
Cooktown	9·32	45	5·99	14·49
Herberton	4·21	34	7·64	2·63
Ingham	9·21	29	3·07	20·11
Innisfail	21·95	40	19·93	31·33
Mossman	12·52	13	11·86	25·84
Townsville	3·97	50	0·32	18·47
Central Coast.				
Ayr	3·02	34	0·31	11·30
Bowen	3·09	50	0·23	1·73
Charters Towers ...	1·84	39	0·27	4·68
Mackay	6·94	50	3·20	8·74
Proserpine	7·04	18	4·89	8·32
St. Lawrence ...	2·89	50	0·44	0·78
South Coast.				
Biggenden	1·68	22	4·01	1·42
Bundaberg	2·78	38	8·81	1·53
Brisbane	3·64	70	8·06	2·00
Childers	2·30	26	8·47	0·61
Crohamhurst ...	5·42	25	14·66	6·33
Esk	2·63	34	4·85	2·25
Gayndah	1·33	50	1·07	0·76
Gympie	3·08	51	6·76	1·93
Glasshouse M'tains	4·86	13	9·31	6·71
Kilkivan	2·06	42	3·69	1·28
Maryborough ...	3·24	50	9·76	2·41

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of Years' Records.	April, 1921.	April, 1920.
South Coast— continued:	In.		In.	In.
Nambour	4·82	25	11·52	6·36
Nanango	1·87	39	1·94	2·17
Rockhampton ...	2·32	34	1·21	1·39
Woodford	4·11	34	8·94	3·78
Darling Downs.				
Dalby	1·28	51	0·15	0·34
Emu Vale	1·20	25	1·27	0·90
Jimbour	1·33	33	0·19	0·33
Miles	1·46	36	0·13	0·22
Stanthorpe ...	1·72	48	1·48	1·37
Toowoomba ...	2·49	49	3·27	1·68
Warwick	1·38	34	1·17	1·11
Maranoa.				
Roma	1·31	47	Nil	0·59
State Farms, &c.				
Bungeworgorai ...	0·99	7	0·01	0·56
Gatton College ...	1·69	22	1·83	0·51
Gindie	1·29	22	0·08	0·85
Hermitage ...	1·37	15	0·64	0·70
Kairi	4·24	7	14·70	5·98
Sugar Experiment Station, Mackay	5·54	24	2·76	7·28
Warren	1·41	7	0·85	0·70

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for April, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

J. H. HARTSHORN,
Acting State Meteorologist.

Answers to Correspondents.

W.K.B. (Chinchilla).—The subject suggested is already in hand, and the first of a series of articles will appear shortly.

THE ORCHARD.

E.A.T. (Llanelly, via Roma).—Your inquiries with regard to citrus trees and the propagation of the grape by cuttings were referred to Mr. C. Ross, Instructor in Fruit Culture, who advises as follows:—

''*Protecting Citrus Trees from Frost.*—The method suggested in the last paragraph of your letter—viz., covering the main stem and branches with loose bagging in addition to covering over trees with bush roofing—is as good as any that could be recommended, with the addition of a good surface mulch of dead grass or straw.

''*Propagation of the Grape by Cuttings.*—Prepare short jointed cuttings about 18 inches in length by making a clean cut ½ an inch below the base eye. If they are to be rooted in a bed for transplanting the following season, the cuttings should be dibbled in two-thirds of their length with a bar, leaving one, two, or three buds above ground level. The base of each cutting should be well tamped. A good sandy loam deeply and thoroughly pulverised is the most essential for a good strike. The cuttings may be inserted 1 foot apart in rows at 3 feet intervals. When cuttings are planted in permanent positions in the vineyard, 6 feet is usually the distance from plant to plant and the rows 9 to 10 feet apart.''

ZAMIA AND RICKETS.

A. PEARCE (Moongan).—Your letter was referred to the Government Botanist, Mr. C. T. White, who advises as follows:—

(1) All the Cycadaceæ or Zamia family cause rickets in cattle.

(2) The ''Zamia'' is definitely poisonous.

(3) *Bowenia* (a so-called ''Zamia Fern'' or ''Fern Zamia''): This plant, though different from other members in appearance, is one of the Zamia family, and is harmful to cattle, causing the disease known as rickets.

(4) Is there any cure for the rickets?—Little can be done in this direction. The Chief Inspector of Stock (Major A. H. Cory, M.R.C.V.S.) has recommended the following:—''The first action to be taken is to prevent the animals gaining access to the plant, and a purgative should be given to the affected animals, consisting of ¾ of a pound to 1 pound of Epsom salts in 3 pints of water, as a drench. After the drench has worked, the animals should be given the following powder twice daily, either mixed in food or in a pint of cold water:—Potassium iodide, 2 drachms; Powdered nux vomica, 1 drachm; Powdered gentian, 4 drachms.

CAROB AND ALGAROBA BEANS.

''FARMER'' (Mackay).—See article on the Carob and Algaroba beans in this issue by Mr. C. T. White, F.L.S., Government Botanist. The Curator of the Botanic Gardens has been asked to send you a few seeds of the Algaroba Bean, supplies of which are at present very limited. Carob seeds are now very difficult to obtain. An application to the Curator, Botanic Gardens, Adelaide, or Messrs. Bunning and Co., Melbourne, may bring a satisfactory response. Tree tomato seed is obtainable from T. H. Wood, Seedsman, George street, Brisbane. Price, 10s. per dozen.

CASTOR OIL PLANT.

R. F. MICHIE.—All the information you desire is covered by an article on ''The Castor Oil Plant in Queensland'' by Mr. Daniel Jones, and which appeared in the ''Journal'' for June, 1919. We are forwarding you a copy direct.

WATERCOURSE BOUNDARIES.

''INQUISITIVE'' (Mossman).—The Department of Public Lands advises as follows:—If an alteration of the channel of a boundary watercourse should take place suddenly, say, through the agency of flood waters, it would be fully within the rights of the owners of the land on each side of the watercourse, or the owner on one of the sides, to restore the original condition of things. If, however, the alteration of the channel of a boundary watercourse is gradual and imperceptible or beyond the power of neighbouring owners to resist, as is common in the case of a crooked watercourse caused by gradual erosion in places and accretion or silting up in other places, the resulting water channel must be regarded as the boundary between the properties.

The Markets.

The following mid-month (14th May, 1921) market survey is abridged from weekly departmental summaries of prospects and prices:—

Agricultural.—The Downs received beneficial rains in the course of the second week, the highest registration being 115 pts. at Bell. Dalby recorded 108 pts. The favoured area extended into the South-West as far as Surat and St. George, where thunderstorms precipitated 140 pts. Thunderstorms were reported from Rockhampton, Maryborough, and Kingaroy, while the coastal areas generally were fairly well served. The Maranoa was still in want of rain, and the Boonah district was unfortunate in missing most of the sea-board falls. Field operations were being delayed in consequence, but it is hoped that situation has been relieved by more recent downpours.

The markets were generally described as dull and all lines in reduced demand.

Produce.	Price.	Demand.
Chaff—		
Lucerne	4s. 9d. to 9s.	Weak.
Mixed	4s. 1d. to 7s. 1d.	Inactive. Primes withheld, 6s. 6d.
Oaten	Local, 4s.; Imported, 8s.	Large offerings withheld.
Maize	3s. 9½d. to 3s. 11d.	
Potatoes	4s. to 6s. 9d.	Weak. Supplies heavy.
Sweet Potatoes	Up to 2s. 6d.	Practically unsaleable.
Pumpkins	Up to 4s. 8d.	
Chick Wheat	4s. to 5s. 9d.	
Barley	2s. 9d. offered.	
Broom Millet	£23 to £28 per ton	

Dairy Produce.—Quantity graded for week ended 14th May, 1921—Butter, 13,908 boxes (56 lb. each); cheese, 178 crates (142 lb. each). In cold storage awaiting shipment on 15th May, 1921—Butter, 35,474 boxes (56 lb. each); cheese, 465 crates (142 lb. each). The bulk of supplies, first grade butter, went to Southern States.

Fruit.—Bananas continue to go South in large quantities by rail, both from the Tweed and Blackall Range districts, and are readily quitted.

The pineapple Winter crop coming forward. On account of late rains the fruit matured well and found favour in the South.

Oranges and mandarins are coming forward from Northern ports in marked contrast, in respect to condition, to last year's consignments for the corresponding period.

This seasons prolific strawberry crop promises the creation of market difficulties. Efforts are being made to induce canners to contract for the heavy output.

Stanthorpe vegetables, particularly cabbage, quitted daily at prices generally satisfactory to the grower.

Apples and pears are being received in large consignments by direct steamer from Tasmania.

Fat Stock.—Cattle: 1,200 were yarded for the second week in May. Most of the yarding was made up of useful trade beef, but prime pens were not many. Competition good, values less firm than preceding week, due to larger supplies. Good and prime ranged from 26s. to 28s. per 100 lb. An occasional pen of choice light-weights went to 30s. Cows, good and prime, realised from 20s. to 25s. per 100 lb.

Sheep: About 6,800 penned, chiefly good mutton. Prime wethers scarce. Values below previous week's rates. Demand fairly firm, useful lines readily quitted. Good and prime wether mutton averaged about 3d. per lb. An occasional choice pen went to 4d. Good ewes were worth about 3d. per lb.

Orchard Notes for July.

THE SOUTHERN COAST DISTRICTS.

The notes for the month of June apply to July as well. The first crop of strawberries will be ripening during the month, though extra early fruit is often obtained in June, and sometimes as early as May, under especially favourable conditions. Look out for leaf-blight, and spray for same with Bordeaux mixture, also watch for the first signs of the grey mould that attacks the fruit, and spray with the sulphide of soda wash. The larvæ of the cockchafer, that eats the roots of strawberries, should be looked for, and destroyed whenever found. Pruning of citrus and other fruit trees may be continued; also, the spraying with lime and sulphur. Where the ringing borer, that either attacks the main trunks or the branches at or near where they form the head of the tree, is present, the main stems and trunks should either be painted or sprayed with the lime and sulphur wash during the month, as the mature beetles that lay the eggs that eventually turn to the borers sometimes make their appearance during the month, and unless the trees are protected by the wash they lay the eggs, which hatch out in due course and do a lot of damage. Keep the orchard clean, so that when the spring growth takes place the trees may be in good condition. There is usually a heavy winter crop of pineapples ripening during this and the following month, particularly of smooth leaves. See that any conspicuous fruits are protected by a wisp of grass, as they are injured not only by frost but by cold westerly winds.

THE TROPICAL COAST DISTRICTS.

See the instructions given for the month of June. Keep the orchards clean and well worked. Prune and spray where necessary.

THE SOUTHERN AND CENTRAL TABLELANDS.

Where pruning of deciduous trees has not been completed, do so this month. It is not advisable to leave this work too late in the season, as the earlier the pruning is done after the sap is down the better the buds develop—both fruit buds and wood buds; thus securing a good blossoming and a good growth of wood the following spring.

Planting can be continued during the month; if possible, it should be finished this month, for, though trees can be set out during August, if a dry spell comes they will suffer, when the earlier planted trees, which have had a longer time to become established, will do all right—provided, of course, that the land has been properly prepared prior to planting, and that it is kept in good order by systematic cultivation subsequent to planting.

Do not neglect to cut back hard when planting, as the failure to do so will result in a weakly growth.

As soon as the pruning is completed, the orchards should get their winter spraying with the sulphur limewash, and either with or without salt, as may be wished. See that this spraying is thoroughly carried out, and that every part of the tree is reached, as it is the main treatment during the year for San José and other scale insects, as well as being the best time to spray for all kinds of canker, bark-rot, moss, lichens, &c.

Where the orchard has not been ploughed, get this done as soon as the pruning and spraying are through, so as to have the land in good order for the spring cultivations. See that the work is well done, and remember that the best way to provide against dry spells is to keep moisture in the soil once you have got it there, and this can only be done by thorough and deep working of the soil.

When obtaining trees for planting, see that they are on good roots, and that they are free from all pests, as it is easier to prevent the introduction of pests of all sorts than to eradicate them once they have become established. Only select those varieties that are of proved merit in your district; do not plant every kind of tree that you see listed in a nurseryman's catalogue, as many of them are unsuited to our climate. The

pruning of grape vines may be carried out in all parts of the tablelands other than the Stanthorpe district, where it is advisable to leave this work as long as possible, owing to the danger of spring frosts.

Where grape vines have been well started and properly pruned from year to year, this work is simple; but where the vines have become covered with long straggling spurs, and are generally very unsightly, the best plan is to cut them hard back, so as to cause them to throw out good strong shoots near the main stem. These shoots can be laid down in the place of the old wood in following seasons, and the whole bearing portion of the vine will be thus renewed.

Where vineyards have been pruned, the prunings should be gathered and burnt, and the land should receive a good ploughing.

Farm and Garden Notes for July.

FIELD.—The month of July is generally considered the best time to sow lucerne, for the reason that the growth of weeds is then practically checked, and the young lucerne plants will, therefore, not be retarded by them, as would be the case if planted later on in the spring. If the ground has been properly prepared by deep ploughing, cross-ploughing, and harrowing, and an occasional shower occurs to assist germination and growth, the lucerne will thrive so well that by the time weeds once more appear it will be well able to hold its own against them. From 10 to 12 lb. of seed drilled, or 15 to 16 lb. broadcast, will be sufficient for an acre. This is also the time to prepare the land for many field crops, such as potatoes, maize, oats, and barley for green fodder; also, rye, vetches, tobacco, cotton, sugar-cane, field carrots, mangolds, swedes, canaigre, &c. Early potatoes, sugar-cane, and maize may be planted in very early districts, but it is risky to plant potatoes during this month in any districts liable to late frosts or in low-lying ground. Under such conditions, it is far better to wait until well into the following month. The greatest loss in potatoes and sugar-cane has been, on more than one occasion, experienced in September, when heavy frosts occurred in low-lying districts in the Southern portion of the State. During suitable weather, rice may be sown in the North. The coffee crop should now be harvested, and yams and tumeric unearthed.

KITCHEN GARDEN.—Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. Never walk over the land during wet weather with a view to sowing. The soil cakes and hardens, and good results cannot then be expected. This want of judgment is the usual cause of hard things being said about the seedsman. In fine weather, get the ground ploughed or dug, and let it lie in the rough till required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil deprived of the sweetening influences of the sun, rain, air, and frost. Where the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities, it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops. Sow Guada beans (snake gourd) at the end of September.

FLOWER GARDEN.—Winter work ought to be in an advanced state. The roses will now want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolor, marigolds, cosmos, cox-combs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberose, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August and September.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	MAY.		JUNE.		JULY.		AUGUST.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
2	6·14	5·16	6·31	5·0	6·39	5·3	6·30	5·18
3	6·15	5·15	6·32	5·0	6·39	5·4	6·29	5·19
4	6·15	5·14	6·32	5·0	6·39	5·4	6·28	5·19
5	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·20
6	6·16	5·13	6·33	5·0	6·39	5·5	6·27	5·21
7	6·17	5·12	6·34	5·0	6·39	5·5	6·26	5·21
8	6·17	5·11	6·34	5·0	6·39	5·6	6·25	5·22
9	6·18	5·10	6·34	4·59	6·39	5·6	6·25	5·22
10	6·18	5·10	6·35	4·59	6·40	5·6	6·24	5·23
11	6·19	5·9	6·35	4·59	6·40	5·7	6·23	5·23
12	6·19	5·8	6·35	4·59	6·39	5·7	6·22	5·24
13	6·20	5·8	6·35	4·59	6·38	5·8	6·21	5·24
14	6·20	5·7	6·36	4·59	6·38	5·8	6·20	5·25
15	6·21	5·7	6·36	5·0	6·38	5·9	6·19	5·25
16	6·22	5·6	6·36	5·0	6·37	5·10	6·18	5·26
17	6·22	5·5	6·37	5·0	6·37	5·10	6·17	5·26
18	6·23	5·5	6·37	5·0	6·37	5·11	6·16	5·27
19	6·23	5·4	6·37	5·0	6·36	5·11	6·15	5·27
20	6·24	5·4	6·38	5·0	6·36	5·12	6·14	5·28
21	6·24	5·3	6·38	5·1	6·36	5·12	3·14	5·28
22	6·25	5·3	6·38	5·1	6·35	5·13	6·13	5·28
23	6·26	5·3	6·38	5·1	6·35	5·13	6·12	5·29
24	6·26	5·2	6·38	5·1	6·35	5·14	6·11	5·29
25	6·27	5·2	6·39	5·1	6·34	5·14	6·10	5·29
26	6·28	5·2	6·39	5·2	6·34	5·15	6·9	5·30
27	6·28	5·1	6·39	5·2	6·33	5·15	6·8	5·30
28	6·29	5·1	6·39	5·2	6·33	5·16	6·7	5·31
29	6·29	5·1	6·39	5·2	6·32	5·16	6·6	5·31
30	6·30	5·0	6·39	5·3	6·32	5·17	6·5	5·32
31	6·31	5·0	6·39	5·3	6·31	5·17	6·4	5·32

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland New South Wales, and Victoria, where the clock time is identical).

			H. M.
8 May.	●	New Moon	7 2 a.m.
15 „	☾	First Quarter	1 25 a.m.
22 „	○	Full Moon	6 15 a.m.
30 „	☽	Last Quarter	7 45 a.m.

Perigee on 12th at 6·12 a.m.
Apogee on 27th at 8·48 p.m.

6 June	●	New Moon	4 14 p.m.
13 „	☾	First Quarter	7 0 a.m.
20 „	○	Full Moon	7 41 p.m.
28 „	☽	Last Quarter	11 17 p.m.

Perigee on 8th at 6·54 p.m.
Apogee on 24th at 11·42 a.m.

5 July	●	New Moon	11 36 p.m.
12 „	☾	First Quarter	2 16 p.m.
20 „	○	Full Moon	10 8 a.m.
28 „	☽	Last Quarter	12 20 p.m.

Perigee on 6th at 10·54 p.m.
Apogee on 21st at 8·18 p.m.

4 Aug.	●	New Moon	6 17 a.m.
11 „	☾	First Quarter	12 14 a.m.
19 „	○	Full Moon	1 28 a.m.
26 „	☽	Last Quarter	10 51 p.m.

Perigee on 4th at 7·48 a.m.
Apogee on 17th at 10·54 p.m.

No Eclipse of the Sun or Moon will occur till October.

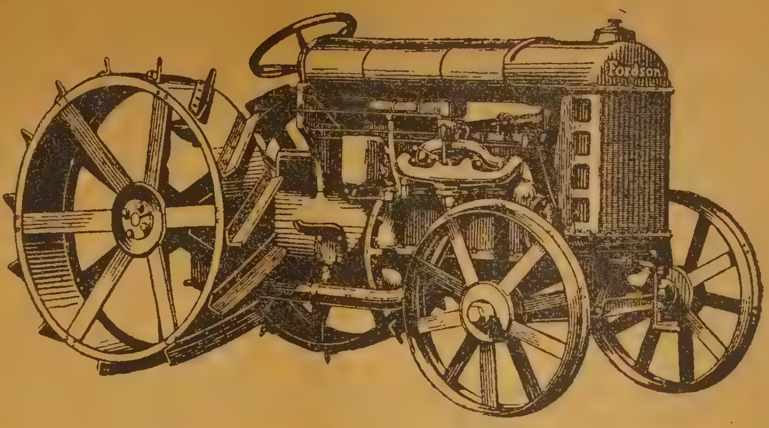
On 2nd July, between 3 and 4 p.m., an interesting occultation of the planet Venus will be taking place; but in Queensland the only thing observable will be the juxtaposition of the two, and binoculars will be required as it will be day-time. The position will be about half-way down to the west of the Sun.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.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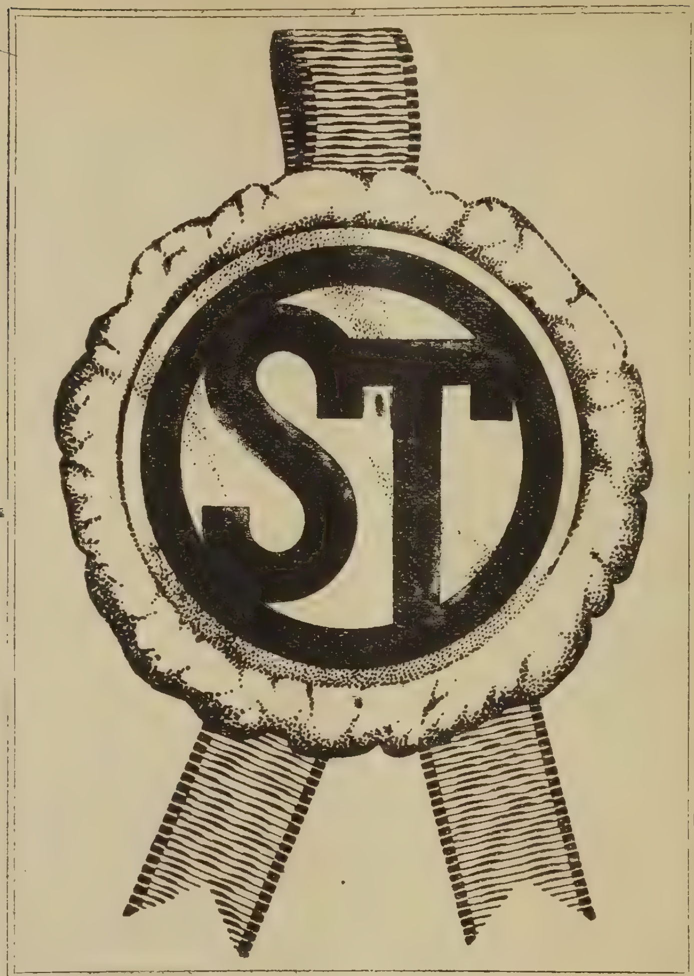

BENEFICIARIES PROTECTED.

In respect to the alleged deficiency in the accounts of the Public Curator's Office at Townsville, and in regard to which a member of the staff is being proceeded against, the Attorney-General, the Hon. J. Mullan, M.L.A., has pointed out that, under an insurance arrangement made by the Public Curator with the Insurance Commissioner, any deficiencies which occur in the administration of an estate are recouped by the State Government Insurance Office. The result is that, in the event of misappropriation of moneys to which they are entitled, beneficiaries suffer no loss.

"In this particular," remarked Mr. Mullan, "the Public Curator's Office gives a complete safeguard and guarantee against dishonesty in the administration of estates. The interests of beneficiaries are absolutely protected."

THE PUBLIC CURATOR.

PROFITS FOR FIVE YEARS.

The Attorney-General (Hon. J. Mullan) stated on Saturday that the profits earned by the Public Curator's Office during the years 1916 to 1920 were as follows:—1916, £1,400; 1917, £1,446; 1918, £5,160; 1919, £5,695; 1920 £2,758.

Mr. Mullan stated that the amount paid in salaries during the year 1920 amounted to £19,130, which represented an increase of £3,938 over the amount paid in 1919. The total sum of money received by the Public Curator during the year was £594,142, and he paid out £568,715.

The number of wills and trusts administered and taken over totalled 1,109, of the estimated value of £759,625. The number of intestate estates under administration during the year totalled 3,272, of an estimated value of £513,065. The number of insolvent estates dealt with was 463, of the value of £30,448. During the year thirteen powers of attorney were executed in favour of the Public Curator, the value of the assets administered under these powers being £22,437. The number of elections filed during the year 1920 was 975, and the value of the assets concerned totalled £112,070. Orders to administer 307 estates were granted to the Public Curator, to the value of £314,316. The number of probates granted during the year was 167, the value of the assets covered by such probates being £138,211.

In the conveyancing branch, 1,096 transfers of real property were registered. The total number of wills made by the Public Curator during the year was 1,226, and the number of wills lodged with the Public Curator to date is 12,017. The Public Curator maintained out of estate funds during the year 1920, 317 infants. The number of mental patients' estates administered or dealt with during the year was 1,076, of an estimated value of £107,194. The number of estates of inmates of charitable institutions, such as Dunwich, Jubilee Sanatorium, and the Diamantina Hospital, amounted to 1,042, of an estimated value of £8,913.

Mr. Mullan expressed pleasure at the progress which the Public Curator's Office was making—a progress which indicated that the public had confidence in the office. He hoped that within a few months the Public Curator and his staff would be accommodated in the new State Government Insurance Office building in George street. The removal of the Public Curator's Office to the new premises would afford greater facilities to the staff and the public.

Horses on a Farm, near Warwick.

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Departmental Announcements.

It is hereby notified that the "Journal" will be supplied to all members of Agricultural and Horticultural Societies in Queensland who do not derive their livelihood solely from the land, on payment, in advance, of an annual subscription of 5s., which will include postage. Queensland Schools of Arts will be supplied at the same rate. Persons resident in Queensland whose main source of income is from Agricultural, Pastoral, or Horticultural pursuits, **which fact should be stated on the attached Order Form,** will receive the "Journal" free

ON PREPAYMENT OF 1s. PER ANNUM, to cover postage.

To all other persons the annual subscription will be 10s., which will include postage.

All remittances should be made by postal notes or money orders, but where they are unobtainable stamps will be accepted, though the Department accepts no responsibility for any loss due to the latter mode of remittance.

For your convenience an Order Form is attached. A cross on each side of the Order Form indicates to the recipient that his subscription is again due. Watch also the wrappers on the "Journal." The figures alongside the address serve as a receipt, and they also indicate when the subscription expires—thus, "9/17" means that subscription expires with the copy of the ninth (September) month in the year 1917.

Amount of one year's subscription should be forwarded with Order Form before the 15th of the month to the **Under Secretary,** Department of Agriculture and Stock, Brisbane.

All new subscriptions or renewals received for the "Journal" after the tenth day of the month will commence with the month after that on which the subscription is received. Previous copies available will be supplied at 6d. per copy to subscribers only. To all others 1s. per copy.

The Editor will be glad to receive any papers of special merit which may be read at meetings of Agricultural and Pastoral Associations in Queensland, reserving, however, the right to decide whether their value and importance will justify their publication.

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NOTE.—Subscribers who wish to obtain the Journal for the month when the subscription is sent, must apply before the fifteenth of that month.

Secretaries of Associations are requested to be good enough to forward to the Editor, as early as possible, the dates of forthcoming Shows, as it is important in the interests of the Associations that these dates should be published. Changes in dates must also be promptly advised.

It is equally necessary that prompt notice be given to the Editor of changes in the Secretaryship of any Society or Association, a matter which is much neglected. Furthermore, information concerning dates on which shows are to be held must be forwarded to the Editor at least six weeks before the Show date. If these suggestions are not complied with, the Society whose Secretary neglects to supply the required information will be liable to be struck off the list of Societies published in the "Journal."

To enable recipients of the "Queensland Agricultural Journal" to have the half-yearly volume bound, Covers in Boards and Cloth will be supplied from this Office on application to the Under Secretary for Agriculture. Applications must be accompanied by a remittance to cover cost. Covers will be supplied at **One Shilling** and **One Shilling and Ninepence** each.

In order to avoid disappointment, correspondents who wish for replies to questions in the Journal are requested to note that it is imperative that all matter for publication on the first day of any month should reach the Editor by the 15th of the previous month.

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Pamphlets on different subjects relating to Agriculture, Horticulture, and Stock are issued by the Department, and may be obtained **gratis**, on application to the Under Secretary.

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